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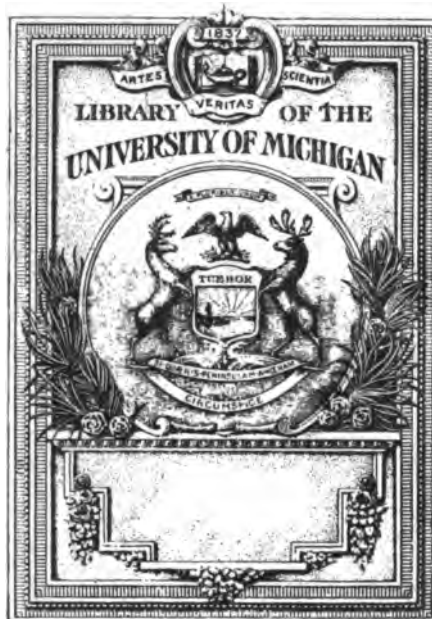
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DEPARTMENT OF COMMERCE

BUREAU OF THE CENSUS

SAM. L. ROGERS, DIRECTOR

CENSUS OF ELECTRICAL INDUSTRIES: 1917

CENTRAL ELECTRIC LIGHT
AND POWER STATIONS

WITH

SUMMARY OF THE ELECTRICAL INDUSTRIES



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

CENSUS OF ELECTRICAL INDUSTRIES: 1917.

CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

STREET AND ELECTRIC RAILWAYS.

TELEGRAPHS AND MUNICIPAL ELECTRIC FIRE-ALARM AND POLICE-PATROL SIGNALING SYSTEMS.

TELEPHONES.

(2)

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LETTER OF TRANSMITTAL.

DEPARTMENT OF COMMERCE,
BUREAU OF THE CENSUS,
Washington, D. C., December 16, 1919.

SIR:

I transmit herewith the report on the census of Central Electric Light and Power Stations for 1917. This report is a part of that on electrical industries, which in its entirety also covers electric railways, telephones, telegraphs, and municipal electric fire-alarm and police-patrol signaling systems.

This is the third report on these industries that has been taken in conformity with the requirements of the act of Congress of June 7, 1906. The work of obtaining the data for the report was done by employees detailed from the permanent force of the bureau and by correspondence, and the statistics were secured during the year 1918 and relate in general to the year ending December 31, 1917.

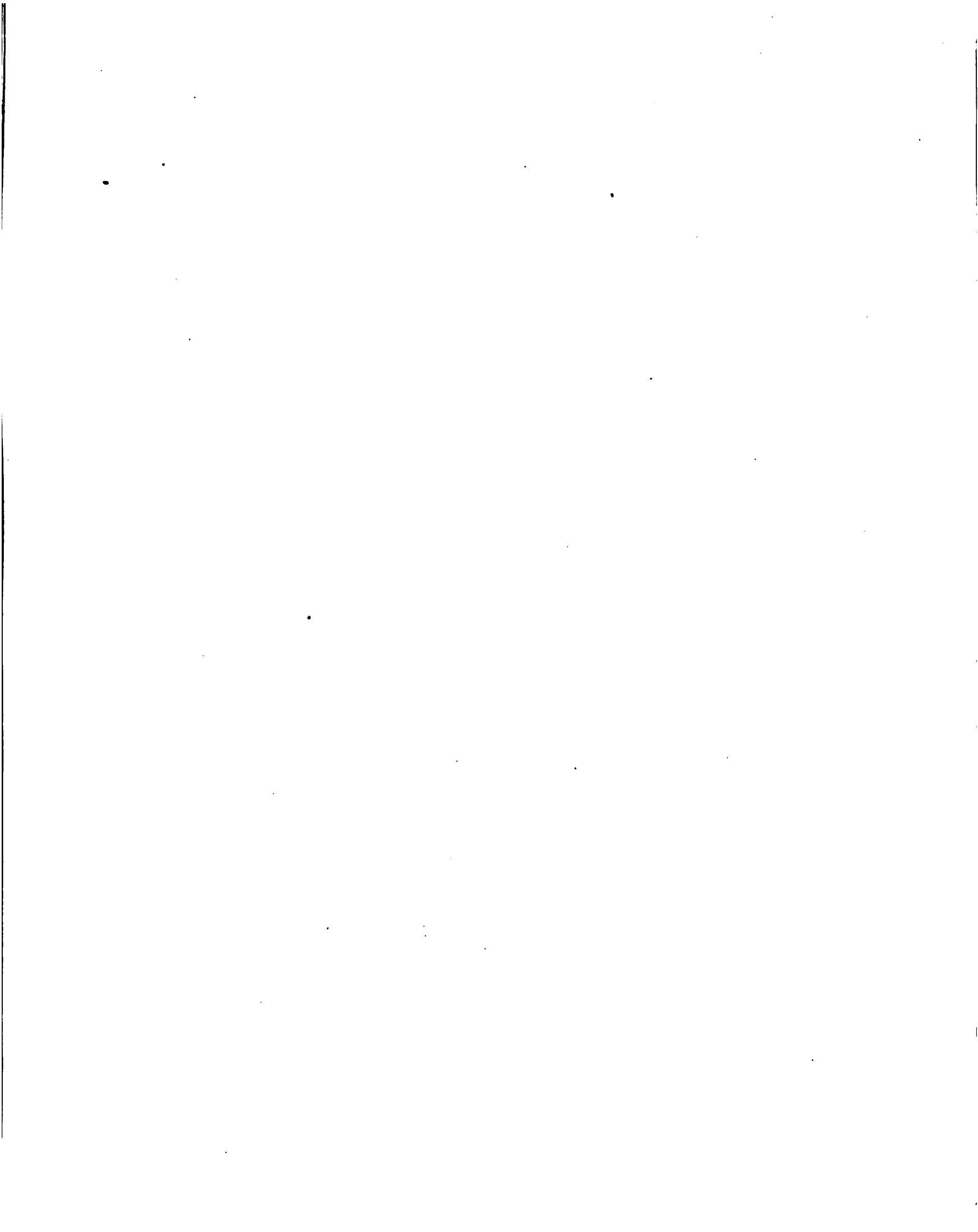
The statistics were collected and the report prepared under the supervision of Eugene F. Hartley, chief statistician for manufactures. Acknowledgment is also made of the services of Edmond E. Lincoln, expert special agent, who compiled the text and outlined the analytical tables, and of Frank L. Sanford, expert special agent, who assisted in the assembling and preparation of the material for the report.

Respectfully,

SAM. L. ROGERS,
Director of the Census.

Hon. JOSHUA W. ALEXANDER,
Secretary of Commerce.

(7)



SUMMARY OF THE ELECTRICAL INDUSTRIES.

GENERAL STATISTICS.

The special census of 1917 covers five distinct electrical industries, as follows: (1) Central electric light and power stations; (2) Electric railways; (3) Telephones; (4) Telegraphs; and (5) Municipal electric fire-alarm and police-patrol signaling systems.

These industries resolve themselves into two groups of a similar character, electric light and power stations and electric railways constituting one group, and telephones and telegraphs, together with fire-alarm and police-patrol signaling systems, the other. The statistics for the first two industries named are presented in this report, while the data for the last three are collected in a separate report. The accompanying table summarizes the more important statistics for the first four in-

dustries, both separately and combined, for 1917, 1912, 1907, and 1902. In the table are shown for the several items and for the successive years the per cent which each industry forms of the total, and also the percentages of increase in number of plants or systems, employees, salaries and wages, capitalization, income, expenses, and net income, for each five-year period, for the decade 1907-1917, and for the entire period 1902-1917.

As municipal electric fire-alarm and police-patrol signaling systems are not operated commercially, and as the statistics relating thereto have little in common with the other industries, they have been excluded from this combined summary.

THE ELECTRICAL INDUSTRIES: 1917, 1912, 1907, AND 1902.

Table 1	Census year.	Total.	Central electric light and power stations.	Electric railways.	Telephones.*	Telegraphs* (land and ocean).	PER CENT OF TOTAL.			
							Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
Number of companies, stations, or systems.	1917	10,076	6,542	1,307	2,200	27	64.9	13.0	21.8	0.3
	1912	8,424	5,221	1,260	1,916	27	62.0	15.0	22.7	0.3
	1907	7,612	4,714	1,236	1,636	26	61.9	16.2	21.5	0.3
	1902	7,789	3,620	987	3,157	25	46.5	12.7	40.5	0.3
	1902-1917	29.4	80.7	32.4	-30.3	8.0				
Per cent of increase.	1907-1917	32.4	38.8	5.7	34.5	3.8				
	1912-1917	19.6	25.3	3.7	14.8	0.0				
	1907-1912	10.7	10.8	1.9	17.1	3.8				
	1902-1917	-2.3	30.2	25.2	-48.2	4.0				
Employees, salaries, and wages: Average number.	1917	696,431	105,541	294,826	244,490	51,574	15.2	42.3	35.1	7.4
	1912	582,452	79,335	282,461	183,361	37,295	13.6	48.5	31.5	6.4
	1907	428,765	47,632	221,429	131,670	28,034	11.1	51.6	30.7	6.5
	1902	277,474	30,326	140,769	78,752	27,627	10.9	50.7	28.4	10.0
	1902-1917	151.0	248.0	109.4	210.5	86.7				
Per cent of increase.	1907-1917	62.4	121.6	33.1	85.7	84.0				
	1912-1917	19.6	33.0	4.4	33.3	38.3				
	1907-1912	35.8	66.6	27.6	39.3	33.0				
	1902-1917	54.5	57.1	57.3	67.2	1.5				
Salaries and wages.	1917	\$571,781,197	\$95,241,858	\$267,240,362	\$169,655,066	\$39,643,911	16.7	46.7	29.7	6.9
	1912	353,034,528	61,161,941	200,867,052	96,040,541	24,964,994	16.0	52.4	25.1	6.5
	1907	269,229,021	35,420,324	150,991,099	65,009,249	17,808,249	13.2	56.1	24.1	6.6
	1902	160,152,151	20,646,692	88,210,165	36,255,621	15,039,673	12.9	55.1	22.6	9.4
	1902-1917	257.0	361.3	203.0	367.9	163.6				
Per cent of increase.	1907-1917	112.4	168.9	77.0	161.0	122.6				
	1912-1917	49.3	55.7	33.0	76.6	58.8				
	1907-1912	42.3	72.7	33.0	47.7	40.2				
	1902-1917	68.1	71.6	71.2	79.3	18.4				
Capitalization.	1917	\$9,991,164,215	\$3,060,392,141	\$5,532,223,818	\$1,169,460,470	\$229,087,796	30.6	55.4	11.7	2.3
	1912	8,081,223,659	2,175,678,266	4,708,568,141	970,590,442	226,386,810	26.9	58.1	12.2	2.8
	1907	5,830,687,500	1,086,913,622	3,774,772,096	738,688,207	220,293,575	18.7	64.5	13.0	3.8
	1902	3,324,000,034	504,740,352	2,308,262,099	348,031,058	162,946,525	15.2	69.4	10.5	4.9
	1902-1917	200.5	506.3	139.7	236.0	40.6				
Per cent of increase.	1907-1917	71.4	179.0	46.6	58.3	4.0				
	1912-1917	28.6	40.7	17.5	20.5	1.2				
	1907-1912	38.6	98.3	24.7	31.4	2.8				
	1902-1917	76.0	117.3	63.5	117.8	35.2				
Income.	1917	\$1,739,664,159	\$526,894,240	\$730,564,691	\$372,501,800	\$109,703,428	30.3	42.0	21.4	6.3
	1912	1,200,138,640	302,273,398	579,208,430	253,893,909	64,762,843	25.2	48.2	21.2	5.4
	1907	829,877,604	175,642,338	426,900,952	175,750,446	51,583,868	21.1	51.4	21.3	6.2
	1902	463,982,821	85,700,005	250,526,642	86,825,536	40,930,038	18.5	54.0	18.7	8.8
	1902-1917	274.9	514.8	191.6	329.0	168.0				
Per cent of increase.	1907-1917	109.6	200.0	71.1	111.9	112.7				
	1912-1917	45.0	74.3	26.1	46.7	69.4				
	1907-1912	44.6	72.1	35.7	44.5	25.5				
	1902-1917	79.0	104.9	70.4	103.5	26.0				

(See footnotes at end of table.)

ELECTRICAL INDUSTRIES: 1917.

THE ELECTRICAL INDUSTRIES: 1917, 1912, 1907, AND 1902—Continued.

Table 1—Continued.

	Census year.	Total.	Central electric light and power stations.	Electric railways.	Telephones. ¹	Telegraphs ² (land and ocean).	PER CENT OF TOTAL.			
							Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
Expenses—total, including salaries and wages, interest, taxes, and fixed charges.	1917	\$1,480,337,159	\$426,568,307	\$648,794,633	\$313,103,060	\$91,871,159	28.8	43.8	21.2	6.2
	1912	987,077,419	234,577,277	491,553,546	202,567,644	58,378,982	23.6	50.1	20.5	5.9
	1907	668,715,140	134,196,911	358,113,401	134,525,215	41,879,613	20.0	53.5	20.2	6.3
	1902	366,764,240	68,081,875	202,570,060	65,164,771	30,948,034	18.6	55.2	17.8	8.4
Per cent of increase.....	1902-1917	303.6	526.6	220.3	380.5	196.9	.....	.....	.....	.....
	1907-1917	121.4	217.9	81.2	132.7	119.4	.....	.....	.....	.....
	1912-1917	50.0	81.8	32.0	54.6	57.4	.....	.....	.....	.....
	1907-1912	47.6	74.8	37.3	50.6	39.4	.....	.....	.....	.....
	1902-1907	82.6	97.1	76.8	107.9	35.3	.....	.....	.....	.....
Net income.....	1917	\$259,327,000	\$100,325,933	\$81,770,058	\$59,398,740	\$17,832,299	28.7	31.5	22.9	6.9
	1912	213,081,221	67,696,121	87,654,884	51,326,325	6,383,891	32.7	39.4	24.8	3.1
	1907	161,162,464	41,445,427	68,787,551	41,225,231	9,704,255	25.7	42.7	25.6	6.0
	1902	97,218,581	17,619,230	47,956,582	21,660,765	9,982,004	18.1	49.3	22.3	10.3
Per cent of increase ⁴	1902-1917	166.7	469.4	70.5	174.2	78.6	.....	.....	.....	.....
	1907-1917	60.9	142.1	18.9	44.1	83.8	.....	.....	.....	.....
	1912-1917	21.7	48.2	-6.7	15.7	179.3	.....	.....	.....	.....
	1907-1912	32.2	63.3	27.4	24.5	-34.2	.....	.....	.....	.....
	1902-1907	65.8	135.2	43.4	90.3	-2.8	.....	.....	.....	.....

¹ Not including municipal electric fire-alarm and police-patrol signaling systems.² Exclusive of systems reporting an annual income of less than \$5,000, except in 1902, when all systems operated primarily for revenue were included.³ Includes the Commercial Cable Co. of Cuba in 1917, 1912, and 1907 (not reported in 1902).⁴ A minus sign (-) denotes decrease.⁵ Value of plant and equipment.⁶ Six companies in 1907 and 30 companies in 1902 failed to furnish this information.⁷ In addition, \$59,639,985 in 1917, \$38,500,030 in 1912, \$20,093,302 in 1907, and \$7,703,574 in 1902 was reported by electric railway companies as income from sale of electric current for light and power or from sale of current to other public service corporations.

The opposite group of diagrams presents graphically the most important data contained in the preceding table for the group of industries comprising (1) "Central electric light and power stations," (2) "Electric railways," (3) "Telephones," and (4) "Telegraphs." They show for each of the census years 1917, 1912, 1907, and 1902 the relative number or amounts for employees, capitalization, income, expenses, and net income, and the per cent distribution of the totals for the specified years.

The central electric light and power industry includes both commercial and municipal central electric stations, but does not include 160 electric light and power stations operated in conjunction with electric railways, the statistics for which could not be separated from the railroad reports. The "value" of plant and equipment is given in this table in place of capitalization, because the municipal plants included do not issue capital stock. The electric railway industry covers both operating and nonoperating, or lessor, companies, together with a few municipal systems. The nonoperating lessor companies did not report the number and compensation of employees, so that the statistics pertaining to employees and salaries and wages relate to operating companies only, but the employees of the lessor companies are usually of the salaried class and relatively few in number. All organization and maintenance expenses of the lessor companies are included under expenses. In view of the fact that the rentals paid to the lessor companies by the operating companies for leased roads would indi-

cate an income which, in the commercial sense, does not exist, the proper adjustments have been made, in order to eliminate the duplication arising therefrom through the combination of income and expense accounts of both classes of companies.

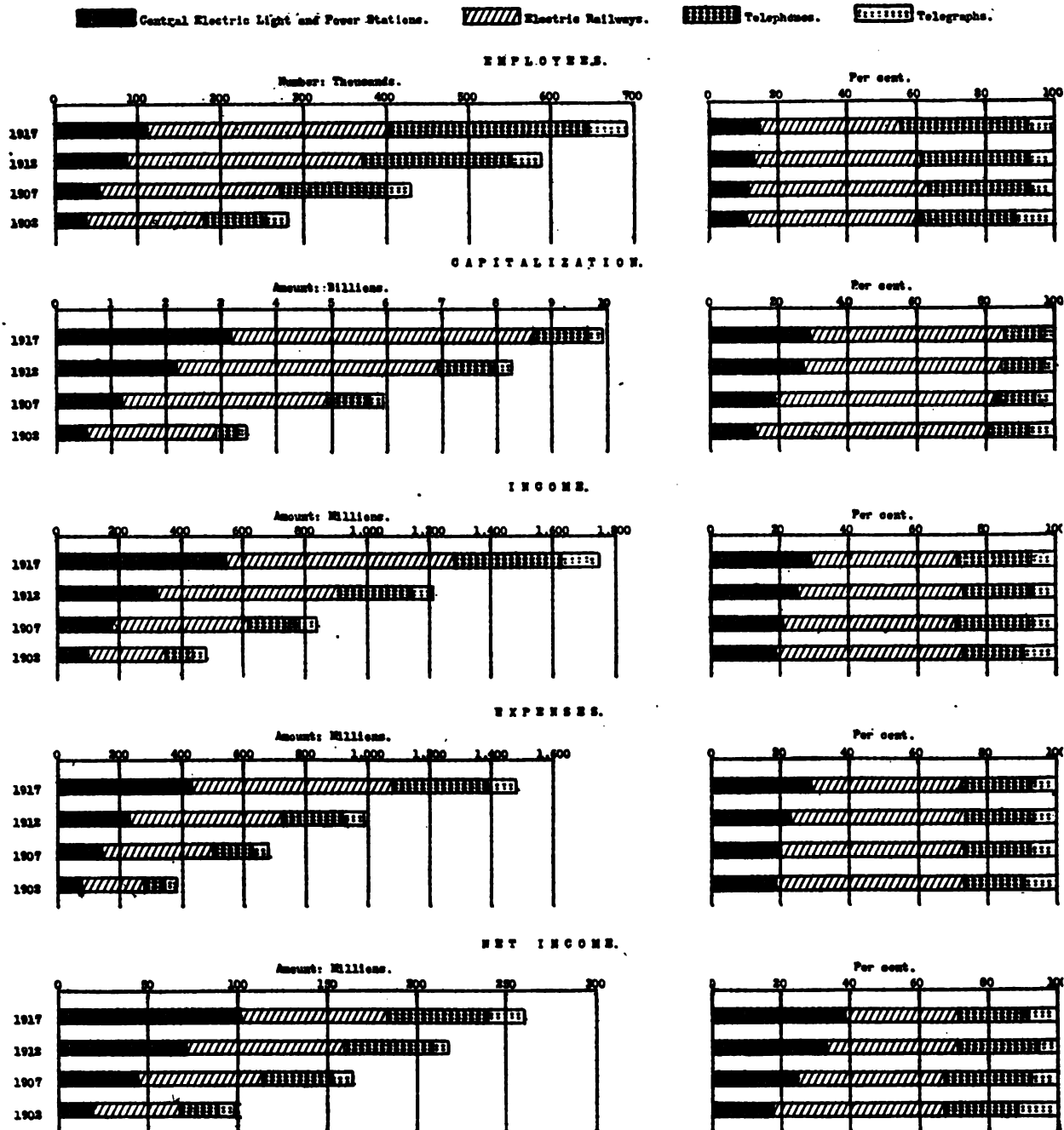
The telephone statistics for 1917, 1912, and 1907 are confined to companies or systems having an annual income of \$5,000 or more, whereas the statistics for 1902 cover all systems operated primarily for revenue, and include a large number of small organizations and rural lines. These minor systems, though numerous and affecting the statistics for employees and salaries and wages, represented in 1902 a comparatively small part of the capitalization, income, and expenses for the telephone industry. The number of these systems increased from 21,335 in 1907 to 51,034 in 1917. In the latter year they represented less than 4 per cent of the total value of "plant and equipment" reported for all telephone systems, and transmitted about 10 per cent of all messages.

Attention should be called to some of the more important developments indicated by Table 1. The proportion which the different items for the telephone and telegraph systems bear to the total for the electrical industries is surprisingly constant throughout the period. On the other hand, there has been, in practically every case, a steady increase in the relative importance of the central electric light and power business, and just as certain a decrease in the relative importance of practically all items pertaining to the electric railway industry.

SUMMARY OF THE ELECTRICAL INDUSTRIES.

11

THE ELECTRICAL INDUSTRIES—EMPLOYEES, CAPITALIZATION, INCOME, EXPENSES, AND NET INCOME: 1917, 1912, 1907, AND 1902.



ELECTRICAL INDUSTRIES: 1917

THE ELECTRICAL INDUSTRIES: 1917, 1912, 1907, AND 1902

Continued.

	Census year.	Total.	Central electric light and power stations.	Electric railways.	Telephone.
Total, including salaries and interest, taxes, and fixed charges.	1917	\$1,480,337,159	\$426,568,307	\$648,794,633	\$313,100,000
	1912	987,077,419	234,577,277	491,553,546	202,525,000
	1907	668,715,140	134,196,911	358,113,401	134,525,000
	1902	366,764,240	68,061,375	202,570,060	65,128,000
	1902-1917	303.6	526.6	220.3	100.0
Percent of increase.	1907-1917	121.4	217.9	81.2	50.0
	1912-1917	50.0	81.8	32.0	33.3
	1907-1912	47.6	74.8	37.3	33.3
	1902-1912	82.6	97.1	76.8	47.6
	1902-1917	186.7	469.4	70.5	52.6
Income.	1917	\$259,827,000	\$100,325,933	\$81,770,058	\$59,721,000
	1912	213,061,221	67,696,121	87,654,884	51,320,000
	1907	161,162,464	41,445,427	68,787,551	41,320,000
	1902	97,218,581	17,619,230	47,956,582	21,320,000
	1902-1917	165.7	469.4	70.5	52.6
Percent of increase.	1907-1917	30.9	142.1	18.9	24.4
	1912-1917	31.7	48.2	-6.7	24.4
	1907-1912	32.2	63.3	27.4	24.4
	1902-1912	65.8	135.2	43.4	24.4
	1902-1917	165.7	469.4	70.5	52.6

- 1 Not including municipal electric fire-alarm and police-patrol signaling systems.
 2 Exclusive of systems reporting an annual income of less than \$5,000, except in 1902, when all systems operated.
 3 Includes the Commercial Cable Co. of Cuba in 1917, 1912, and 1907 (not reported in 1902).
 4 A minus sign (-) denotes decrease.
 5 A minus sign (-) denotes decrease.
 6 Value of plant and equipment.
 7 Six companies in 1907 and 30 companies in 1902 failed to furnish this information.
 8 In addition, \$59,629,985 in 1917, \$36,500,030 in 1912, \$20,093,302 in 1907, and \$7,703,574 in 1902 was reported for current for light and power or from sale of current to other public service corporations.

The opposite group of diagrams presents graphically the most important data contained in the preceding table for the group of industries comprising (1) "Central electric light and power stations," (2) "Electric railways," (3) "Telephones," and (4) "Telegraphs." They show for each of the census years 1917, 1912, 1907, and 1902 the relative number or amounts for employees, capitalization, income, expenses, and net income, and the per cent distribution of the totals for the specified years.

The central electric light and power industry includes both commercial and municipal central electric stations, but does not include 160 electric light and power stations operated in conjunction with electric railways, the statistics for which could not be separated from the railroad reports. The "value" of plant and equipment is given in this table in place of capitalization, because the municipal plants included do not issue capital stock. The electric railway industry covers both operating and nonoperating, or lessor, companies, together with a few municipal systems. The nonoperating lessor companies did not report a number and compensation of employees, so that the statistics pertaining to employees and salaries and wages relate to operating companies only, but the employees of the lessor companies are usually of the skilled class and relatively few in number. All capitalization and maintenance expenses of the lessor companies are included under expenses. In view of the fact that the rentals paid to the lessor companies by operating companies for leased roads would indi-

cate an income not exist, the in order to from through accounts of b-

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Table 4

CENSUS YEAR.	PERCENTAGE RELATION BETWEEN CAPITALIZATION, GROSS INCOME, AND NET INCOME: 1917, 1912, 1907, AND 1902.			
	Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
PER CENT GROSS INCOME IS OF CAPITALIZATION.				
1917.....	17.2	13.2	31.9	47.9
1912.....	13.9	12.3	26.2	28.6
1907.....	16.0	11.3	23.8	23.4
1902.....	17.0	10.9	25.0	25.1
PER CENT NET INCOME IS OF CAPITALIZATION.				
1917.....	3.3	1.5	5.1	7.8
1912.....	3.1	1.9	5.3	2.8
1907.....	3.8	1.8	5.6	4.4
1902.....	3.5	2.1	6.2	6.1

The relations between *net* income and capitalization, however, tell a somewhat different story. There has, upon the whole, been a tendency to decrease in all of the industries studied. So far as the telegraph systems are concerned, the figures, as above explained, must be taken with reservation, particularly the rapid increase from 1912 to 1917. In the central electric stations, also, the change has not been clearly marked, but for telephone companies the proportion has slowly but surely fallen. The drop has been most marked, however, not only from 1912 to 1917, but also for the entire period since 1902, in the electric railway industry, so that the ratio which the net income now bears to the capitalization (1.5 per cent) is relatively about 30 per cent less than in 1902 (2.1 per cent). So far as financial returns in the electrical industries are concerned, the electric railways have constantly been in by far the worst position, followed by the central electric stations. A much better showing is made by the telephones, which, from the nature of their business, do not require so large an investment in proportion to the amount of service rendered. From these simple analyses it would appear that the frequent assertion to the effect that public utilities are operated under conditions of increasing returns is hardly borne out by the facts, at least so far as electrical industries in general are concerned.

In spite of the frequent consolidations, the number of central electric stations has steadily increased, whereas since 1907 the number of electric railways and telegraphs has remained practically stationary. The increase in the number of telephone systems since 1907 has been less marked.

Further, while the number of employees of electric stations and telephone and telegraph companies increased at substantially the same rate between 1912 and 1917, the employees of the electric railways have remained practically unchanged in number. The total salaries and wages paid have in all cases and for every period increased much more rapidly than the number of employees. For the period 1912-1917 the percentage of increase in the aggregate wage bill was greatest for the telephone industry (76.6 per cent), followed by the telegraph companies (58.8 per cent), electric light and power stations (55.7 per cent), the electric railways coming last, with a 33 per cent increase. Accurate averages as to number and salaries and wages can not fairly be determined from the answers made to the inquiry as placed on the schedules, which in 1917, for the electric light and power stations and electric railways, for instance, called for the number of employees on September 29, 1917, or some other representative day, as per pay roll, and the total salaries and wages paid during the year. However, the figures in Table 2, based upon the reports, indicate a significant increase in average salaries and wages.

Table 2

CENSUS YEAR.	AVERAGE SALARIES AND WAGES: 1917, 1912, 1907, AND 1902.			
	Central electric light and power stations.	Electric railways.	Tele-phones.	Tele-graphs (land and ocean).
1917.....	\$902	\$906	\$694	\$769
1912.....	771	711	524	669
1907.....	744	682	494	635
1902.....	681	627	460	544
	PER CENT OF INCREASE.			
1902-1917.....	32.5	44.5	50.9	41.4
1912-1917.....	17.0	27.4	32.4	14.9
1907-1912.....	3.6	4.3	6.1	5.4
1902-1907.....	9.3	8.8	7.4	16.7

It will be seen from Table 2 that the rate of increase in average salaries and wages during the last five-year period was most rapid for telephone employees, 32.4 per cent, and this industry was closely followed by the electric railways at 27.4 per cent. At all census dates until 1917 the average for the electric light and power stations was considerably in the lead, while at all periods the wages in the telephone industry had lagged behind. In 1917, however, the average was practically the same for both central electric stations and for electric railways. The lower scale of

wages, which still maintains in the telephone and telegraph industries, can readily be explained by the fact that young women, girls, and boys are largely employed, and also there is not the same need for a large number of highly trained technical experts, whose services are indispensable in connection with electric light and power stations and electric railways. Further, the actual number who must be highly trained is no doubt relatively greater in the electric light and power business even than in the electric railway industry. The rapid increase in average salaries and wages for the latter since 1912 is probably in considerable measure the result of a better organization of labor in this field.

Table 3

CENSUS YEAR.	PER CENT OF TOTAL EXPENSES INCURRED FOR SALARIES AND WAGES: 1917, 1912, 1907, AND 1902.			
	Central electric light and power stations.	Electric railways.	Tele-phones.	Tele-graphs (land and ocean).
1917.....	22.3	41.2	54.2	43.2
1912.....	26.1	40.9	47.4	42.8
1907.....	28.4	42.2	45.3	42.5
1902.....	30.3	43.5	55.6	48.6

It is further interesting to note, as shown in Table 3, that the relative amount of total expenses incurred for salaries and wages has remained surprisingly constant for the electric railways, has tended to decrease for the telephones until 1912, has remained practically stationary for telegraphs since 1907, but has constantly decreased for the central electric stations since 1902, until now, for the latter industry, the proportion of expenditure under this head (22.3 per cent) is little more than half what it is for the electric railways and the telegraph industry, while for the telephone systems the ratio is highest (54.2 per cent). These relations are of significance in that they show to what extent a slight change in wages paid may, in the case of most electrical industries, affect the net income of the business.

The rate of increase in capitalization during the periods studied has been, as might be expected, much more rapid for the central electric stations than for any of the other electrical industries. Aside from the development of new territory in this business, every increase in population in the district already served makes possible and usually imperative the extension of service and calls for a higher investment. This principle holds true to a somewhat less degree in the telephone business, but is relatively of much less importance in connection with electric railways, while it is practically nonexistent so far as telegraphs are concerned. In studying the financial statistics, however, attention should be particularly called to the

fact that for every census period the expenses of electric railways increased more rapidly than the income, and during the period 1912-1917 the expenses for all electrical industries, except the telegraph companies, also increased much more rapidly than the income. The latter, on account of the unusual activities of the year resulting from our entry into the war, a condition which makes quick communication an absolute essential, reaped a very substantial and unforeseen increase in net return (179.3 per cent).

The net income has, for every electrical industry except the telegraph, increased less rapidly from year to year. The figures for the telegraph business are anomalous because of the fact already mentioned and because the expenses were computed in a different manner in 1912 from that used at preceding dates.¹ In this year depreciation and sinking-fund charges were for the first time included under expenses; hence the net income showed an abnormal decrease between 1907 and 1912. The *total* net income of the electric railways actually decreased by an appreciable amount—nearly \$6,000,000, or 6.7 per cent—between 1912 and 1917. This unsatisfactory state of affairs, which, beyond a doubt, has grown worse since these statistics were collected, has been partially due to the increased costs of material, higher wages, higher taxes, higher interest rates, etc., while few increases were made in fares before 1918. Further, jitneys and private automobiles have probably taken much of the business which would otherwise have gone to the electric railways. It is highly significant that, while there was between 1912 and 1917 merely a 19.5 per cent increase in the number of passengers carried, expenses increased by 32 per cent.

The relations which exist between capitalization, gross income, and net income are shown in Table 4. Until the last census period, 1912-1917, total income increased less rapidly than capitalization in the electric light and power industry. In the case of the electric railways the income has increased with slightly greater rapidity at all periods, while the relations have been relatively constant for the telephone and telegraph companies.

¹ Bulletin 123, Bureau of the Census, Telephones and Telegraphs, 1912, p. 23.

Table 4

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CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

By EDMOND E. LINCOLN, *Expert Special Agent.*

CHAPTER I.—INTRODUCTION AND GENERAL EXPLANATION.

Classes of stations included.—For the purpose of this census a "central electric light and power station" means an electrical establishment operated as a unit, which distributes current to public or private customers for light, power, heat, or traction uses. Accordingly, in this report are included the statistics of all electric plants in the continental United States doing a public service business—that is, all plants, whether owned by individuals, firms, corporations, or municipalities, which generate or purchase electric current for sale, and which were in operation during any portion of the year ending December 31, 1917. All municipal plants, also, are included which do not actually sell current but which supply electrical energy for street or park lighting, as well as for public buildings and other public uses. In the case of electric street railways which sell current for light or power, whenever it was possible to secure separate reports for this portion of their business such central station statistics have been included.

Classes of stations omitted.—The large group of so-called isolated plants operated solely for the benefit of the owner in connection with the factories, mines, mills, stores, hotels, amusement parks, institutions of learning, etc., has been, as usual, excluded, even though, as sometimes happens, a small amount of current is sold to employees. Such plants are by no means typical of the electrical industry. Yet there are thousands of these plants, perhaps even a hundred thousand, some of which are of great size.

Further, no report has been secured from those plants owned and operated by the Federal or state governments primarily for the purpose of supplying light or power to public buildings, military posts, naval stations, Indian reservations, etc. The hydroelectric plants operated by the United States Reclamation Service, and in many cases selling a large part of their current to private consumers, have also been omitted. Finally, those plants which were idle throughout the year or were in process of construction at the end of the year have been excluded.

Number of central electric stations.—The number of central electric stations reported, 6,542, is by no means identical with the number of separate generating stations. Frequently one company, reporting as a unit, will have a number of generating stations in different localities which send current over high-

tension lines to some central point of distribution. This is particularly true of the hydroelectric companies. Further, there have been instances when a holding company has made only one schedule return for several plants operated by it as separate units. When, however, an electric station generates and distributes current directly to consumers every effort has been made to ascertain this fact and to record it as a separate plant for the purposes of this census, irrespective of the owner or management. The number of separate localities actually served, it should be observed, is far greater than the number of central stations.

Again, in a number of instances, as previously mentioned, an electric light and power business is done by electric railways. Unless, however, separate reports could be secured for the central station portion of this business, such plants have not been tabulated with the central electric light and power stations.

Finally, from year to year new stations are constructed and combined with each other or with plants which reported for the preceding census. Many plants, formerly generating current, sell out to other concerns; their equipment is scrapped or kept idle, while they lose their identity and become merely distributing stations for larger systems. As a result of this constant combination and merging, the number of plants reported for the various census years can not, with complete accuracy, indicate the changes which have taken place. They do, however, show the general development of the industry.

Period covered by census.—The data incorporated in this report as a rule cover the calendar year 1917. In several cases, however, schedules were accepted for a fiscal year ending late in 1917 or early in 1918, when it would not seem practicable otherwise to obtain accurate figures. Statistics have also been included for those few plants which operated for only a portion of the year. Of these plants there are several classes—those new plants which began operation some time during the calendar year, those plants which temporarily ceased operation as a result of accidents, those which became defunct, and those which were succeeded by other plants. In case of the latter, combined schedules were prepared, showing the actual operations for the entire year.

Classification of plants.—In this report plants are classified in a number of ways for the purpose of statistical analyses.

1. The grouping into commercial and municipal stations is the most common and probably of greatest interest to the public. Commercial stations are those owned and operated by individuals, partnerships, or public service corporations, as distinguished from plants operated by municipalities. As municipal plants have gradually increased the scope and amount of their commercial business, and since comparatively few still confine their activities solely to the streets and public buildings, there may be a logical inconsistency in classifying plants as "commercial" and "municipal"; but, for the sake of uniformity, the terms are retained. The chief differences between the statistics for commercial and municipal plants at present arise more from the nature of ownership than from the general character of business done. It is interesting to note that municipal plants rarely pay taxes and issue no capital stock.

2. Central stations are further classified as "generating" and "purchasing." Generating stations are those which generate a part or all of their current, whether by means of steam, gas, oil, or water power. Purchasing plants are those which purchase all the current which they distribute, even though they may still have generating equipment not in use. The investment in this group of plants is normally very much smaller in proportion to the amount of business done, and their statistics are in general far simpler than for the other group.

3. Hydroelectric plants are generally referred to as those which generate electric current largely by means of water power, as contrasted with those plants which use other sources of primary power. For the purpose of future analyses, certain restrictions and qualifications of this definition will be made in the proper place. In view of the fact that these plants use no fuel and frequently invest huge sums in water-power development at a more or less advanced stage, and usually transmit their current long distances over high-tension lines, they clearly stand in a class by themselves.

4. Finally, central electric stations are classified as "purely electric" and "composite." The purely electric stations comprise only those engaged solely in the generation and sale of electrical energy. The composite stations include those operated by companies or municipalities which carry on other industries in connection with electric service, such as the manufacture of gas, the operation of waterworks, electric railways, ice plants, and other commercial enterprises. In numerous cases the companies have but one system of accounts, rendering it impracticable to obtain exact statistics covering the operation of the central electric stations. When this outside industry was merely

incident to the operation of the electrical plant, the report was accepted with or without statistics covering such business, in accordance with the methods of accounting followed by the company in question. On the other hand, when an undertaking of considerable importance was carried on along with the electrical business, careful estimates were obtained, so that the statistics would represent only the operations of the electric stations. In a few instances of this kind, however, in which it was found to be impossible satisfactorily to segregate the items on the balance sheet, this inquiry on the schedule unavoidably covers both the electrical and other business.

When income was reported for steam heating, usually from surplus steam, no attempt was made to separate this business from that of the electric station work. Since the sale of electrical supplies and the wiring of buildings, etc., are customary functions of many companies, the income from such sources has been included, and invariably reported as income from "all other sources." Such plants, however, are not regarded as "composite."

Free service.—In most cases no cash income is received by municipal plants for electrical energy supplied for lighting streets and public buildings. In order, however, that the income shown in this report might be accurately compared with the total consumption of electrical energy for all stations, the schedule required that the income for service of this character furnished by municipal plants should be estimated on the basis of what would have been charged for similar service by commercial companies in near-by localities. Commercial plants, also, sometimes rendered free service in consideration of franchise or other privilege, for advertising purposes, or out of a sense of public duty, and a fair income for this service was estimated as above and included in the total.

Comparison with previous censuses.—A partial census of central electric stations was taken in connection with the census of manufactures of 1890. It was found possible, however, to canvass only the state of New York and the city of St. Louis. The results, therefore, are too incomplete for comparison with later periods. A further attempt was made in 1898 by the United States Commissioner of Labor to secure data regarding the electrical industry. The results, published in the Fourteenth Annual Report of the Commissioner, are of great interest and significance. Returns were secured from 320 of the 460 known municipal plants, and from only 632 of the 2,572 commercial plants then in existence.¹

The first complete census of electric light and power stations, however, was taken in 1902, and comparative statistics are confined to that year and to the three quinquennial periods following. In general,

¹ Fourteenth Annual Report of United States Commissioner of Labor, p. 12.

the same form of schedule was used at these four censuses. For 1912, however, it was thought advisable to omit some of the less important subinquiries used at the earlier dates, as data secured from these inquiries were not entirely satisfactory. In that year, also, the amount of current purchased by the different plants was separated from the current generated. On the other hand, more detailed information was required regarding the financial statistics and operations of electric plants, with particular reference to the balance sheet. Deserving of further mention was the change in the method of securing the number of employees. In 1902 and 1907 the average number throughout the year was called for; but as it proved in many cases to be difficult to obtain correct averages, in 1912 the schedule required that the number employed on September 16 be returned, and in 1917 the date was fixed at September 29, or the nearest normal day. It is believed greater uniformity has been secured by the method pursued in 1912 and 1917.

Attention should be called specifically to a number of important changes and additions provided for in the 1917 schedule.

1. In reporting the number and capacity of dynamos, a distinction was made between those operated by water power and those operated by other power.

2. The important inquiry regarding the station output for the first time called for the quantities of current sold or used for the various kinds of service—electric light, power, other public service corporations—for the current used by the plant itself and the distribution and line losses, in addition to the amount generated and purchased.

3. For this census the number of lamps in public buildings and the number of commercial or private lamps were not required, as the accuracy of such data is open to serious question.

4. Under "revenues" the attempt was made for the first time to secure separate data regarding the income from the light and power business.

5. A number of changes were made in the balance sheet of the schedule in accordance with the system of accounting followed by the National Electric Light Association and the Interstate Commerce Commission, with a view to securing greater uniformity and avoiding errors in the returns. Specifically, the "value of plant and equipment" was called for instead of the "cost of construction, equipment, and real estate," as the latter was subject to possible misinterpretation. There was added an item for "other physical property," under which to report the value of investments of this character not properly included under "plant and equipment." Further, the value of "materials and supplies" was separated from "cash, notes, and accounts receivable." "Interest, dividends, and rents receivable," as well as the "premium on capital stock and funded debt," was also called for.

6. The schedule for this year also called for the kind and quantity of fuel used by central electric stations, as is the practice in the census of manufactures.

7. Again, the estimated population of the areas served with electric current was requested for 1917.

8. By means of correspondence and supplementary instructions, the number of separate generating stations, as contrasted with the total number of central electric stations reporting, was secured; and the number of different places served by all plants, which is far in excess of the actual number of stations, was ascertained.

Chief difficulties encountered.—It may at this point not be amiss to call attention to some of the chief difficulties encountered in collecting the statistics for this census. As the detailed answers required regarding the output of current appeared on the schedule for the first time, many of the smaller stations whose records are unsatisfactory, or which keep no records at all, found difficulty in supplying the data. Consequently, this inquiry, the answers to which are of the greatest importance, beyond a doubt necessitated far more attention by the office and more work on the part of special agents than any other portion of the schedule.

Following this, the balance sheet probably occasioned great difficulty, for, in spite of all that has been done by the National Electric Light Association, by the state public service commissions, and by the Federal Government through the Interstate Commerce Commission, many of the smaller plants do not yet keep their accounts according to any standard method. This is particularly true of the numerous group of municipal plants, many of which have not for any length of time been required to report to state commissions and which have not been forced to standardize their systems of accounts through central control. Hence for many of this group of plants a doubt remains regarding the accuracy of the figures given for the "value of plant and equipment," as well as regarding the reported "cash investment" and "profit and loss surplus." The nature of possible errors in this connection will be analyzed in the body of the report.

It was also a problem to secure the desired separation of revenues from light and power sales. With patience, however, the segregation of income was made in practically all cases, so that the current reported as sold for light and power can be fairly compared with the income from the same.

Finally, a few of the larger stations, from the nature of their business, were unable to return the number or horsepower of their stationary motors served. Hence the data presented under this head are not wholly complete.

Certain other difficulties and anomalies will be pointed out in the proper place; but no effort has been

spared, through detailed correspondence, through the field work of special agents, and through the judicious use of all available records, to make this census as comprehensive and accurate as possible.

Special features of the report.—Along with the numerous additions in material and changes in presentation, mention should also be made of certain *special tabulations* prepared for this report with a view to making it possible to study, in somewhat greater detail, important aspects of the efficiency of commercial and municipal plants.

1. The relative amounts of current generated and purchased by the two groups of plants, commercial and municipal, are shown.

2. Commercial and municipal stations have been grouped according to the population of the districts which they served, with a view to showing the density of service for both light and power.

3. By means of a carefully selected group of plants, the relative investments in electric stations per kilowatt capacity of dynamos are presented for plants classified according to size, for commercial and municipal plants, and for steam and hydroelectric plants, as well as for plants which use gas or oil.

4. Through the same process of selection and grouping of plants generating current by means of steam, water power, and gas or oil the relative financial and physical efficiency of operation is shown. For this purpose plants are grouped according to the quantity of current which they generate and according to their ownership, whether commercial or municipal.

5. Finally, an effort is made, in several of the more important points, to compare those plants which purchase all their current with the generating plants. More particularly, typical plants which generate no current have been grouped according to the amount

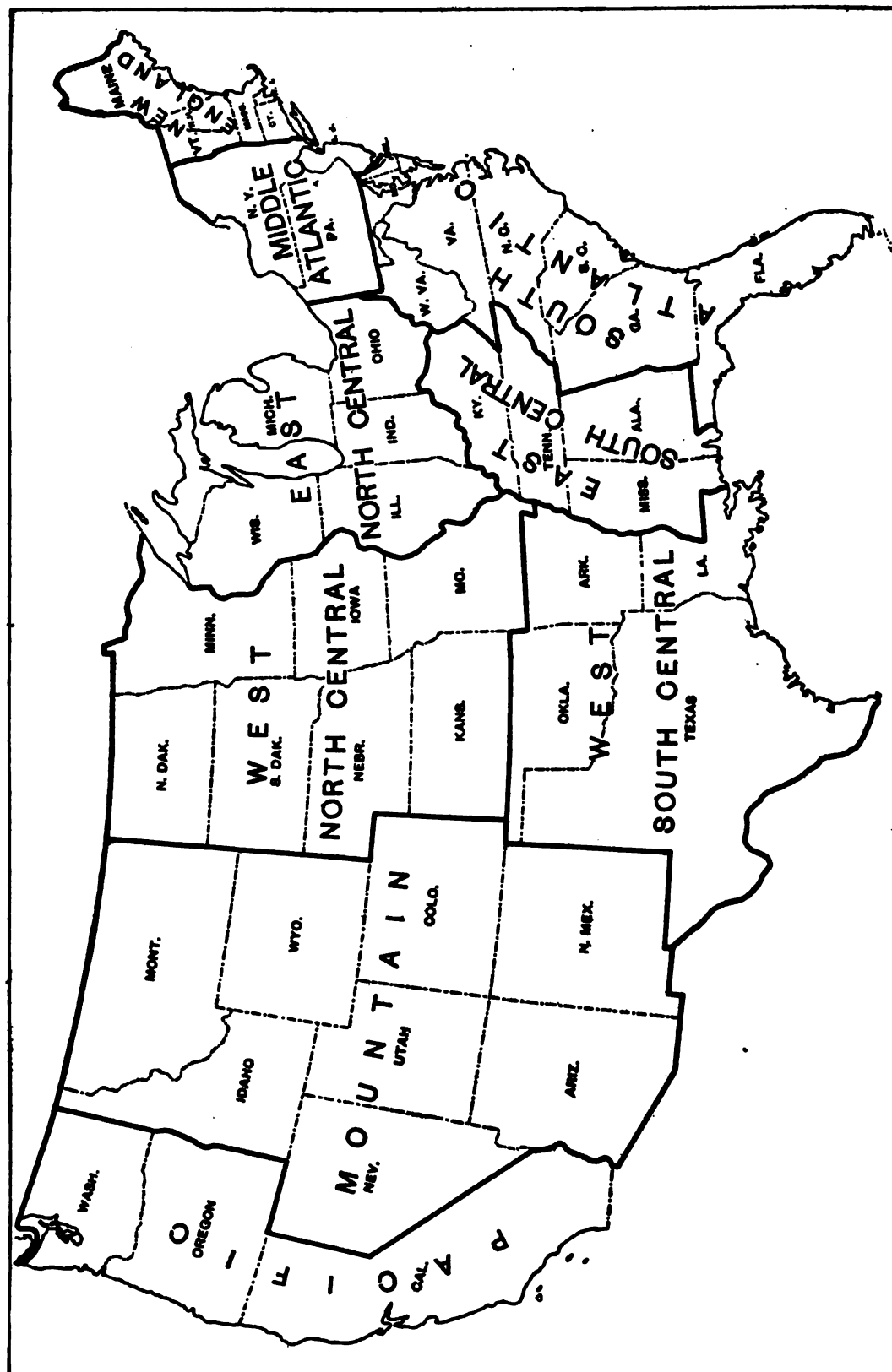
of their output, so that the relative efficiency of size and ownership can be studied.

Geographic divisions.—In a number of the tables in this report the statistics are presented by geographic divisions. In most of the tables the states are grouped into nine grand divisions, but in a few of the tables it was necessary to present the totals by the five divisions used in 1907, in order that the figures might be comparable with those for prior censuses.

From Map 1 (p. 19) and the following list of states, by geographic divisions, the states in each division can readily be determined, whether the division grouping be that adopted for 1912 and 1917 or that used in 1907.

NORTH ATLANTIC DIVISION.	NORTH CENTRAL DIVISION.	SOUTH CENTRAL DIVISION—contd.
<i>New England:</i> Maine. New Hampshire. Vermont. Massachusetts. Rhode Island. Connecticut.	<i>East North Central:</i> Ohio. Indiana. Illinois. Michigan. Wisconsin.	<i>West South Central:</i> Arkansas. Louisiana. Oklahoma. Texas.
<i>Middle Atlantic:</i> New York. New Jersey. Pennsylvania.	<i>West North Central:</i> Minnesota. Iowa. Missouri. North Dakota. South Dakota. Nebraska. Kansas.	WESTERN DIVISION. <i>Mountain:</i> Montana. Idaho. Wyoming. Colorado. New Mexico. Arizona. Utah. Nevada.
SOUTH ATLANTIC DIVISION. Delaware. Maryland. Dist. of Columbia. Virginia. West Virginia. North Carolina. South Carolina. Georgia. Florida.	SOUTH CENTRAL DIVISION. <i>East South Central:</i> Kentucky. Tennessee. Alabama. Mississippi.	<i>Pacific:</i> Washington. Oregon. California.

MAP 1.—GEOGRAPHIC DIVISIONS AS DEFINED BY THE BUREAU OF THE CENSUS.



CHAPTER II.—GENERAL DEVELOPMENT OF CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

Comparative summary of commercial and municipal plants: 1917.—Before entering upon a detailed discussion of the various data secured for the present census, it will be of advantage to examine briefly the relative importance of commercial and municipal

electric stations in the United States. Accordingly, in Table 5 are shown the items of most general interest for both groups of plants, together with the per cent which each forms of the total.

Table 5

	COMPARATIVE SUMMARY OF COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS: 1917.				
	Total.	Commercial.	Municipal.	Per cent of total.	
				Commercial.	Municipal.
Number of plants.....	6,542	4,224	2,318	64.6	35.4
Generating all or part of current.....	5,124	3,347	1,777	65.3	34.7
Purchasing all current.....	1,418	877	541	61.8	38.2
Number of separate generating stations.....	5,952	4,116	1,836	69.2	30.8
Number of cities, towns, etc., served by all stations.....	13,716	11,349	2,367	82.7	17.3
Population of districts served with current.....	1 62,919,662	56,459,723	13,671,460	80.5	19.5
Value of plant and equipment.....	\$3,060,392,141	\$2,933,016,941	\$127,375,200	95.8	4.2
Total income.....	\$526,894,240	\$486,634,021	\$40,260,219	92.4	7.6
Sale of current for light, heat, and power, including free service.....	\$502,059,980	\$462,473,917	\$39,586,063	92.1	7.9
All other sources.....	\$24,834,260	\$24,160,104	\$674,156	97.3	2.7
Total expenses, including salaries and wages ¹	\$426,568,307	\$395,127,395	\$31,440,912	92.6	7.4
Total number of persons employed.....	105,541	94,679	10,862	89.7	10.3
Prime movers:					
Number of units.....	13,795	10,387	3,408	75.3	24.7
Total horsepower.....	12,936,755	12,077,657	859,098	93.4	6.6
Dynamos:					
Number.....	13,428	9,991	3,437	74.4	25.6
Kilowatt capacity.....	8,994,407	8,411,944	582,463	93.5	6.5
Output of stations (total).....	31,044,049,234	29,812,190,746	1,231,858,488	96.0	4.0
Kilowatt hours generated.....	25,438,303,272	24,398,963,183	1,039,320,089	95.9	4.1
Kilowatt hours purchased.....	5,605,745,962	5,413,207,563	192,538,399	96.6	3.4
Kilowatt hours sold (total) ²	25,751,964,800	24,722,517,379	1,029,447,421	96.0	4.0
For light.....	5,112,516,949	4,445,217,785	667,299,164	88.9	13.1
For power.....	13,174,827,277	12,833,191,106	341,636,171	97.4	2.6
To other public service corporations.....	7,464,620,574	7,444,108,488	20,512,086	99.7	0.3
Number of street lamps:					
Arc.....	256,950	206,967	49,983	80.5	19.5
Incandescent and other varieties.....	1,392,284	999,709	422,575	69.6	30.4
Stationary motors served:					
Number ³	555,924	504,864	51,060	90.8	9.2
Horsepower capacity.....	9,216,330	8,790,707	425,623	95.4	4.6
Number of meters.....	7,102,569	6,172,436	930,133	86.9	13.1
Number of customers.....	7,178,703	6,202,189	976,514	86.4	13.6

¹ Duplicated population eliminated.

² In addition to salaries and wages, includes the cost of supplies and materials used for ordinary repairs and replacements, advertising, fuel, mechanical power, electrical energy purchased, taxes, charges for depreciation and charges for sinking fund, and all other expenses incident to operation and maintenance.

³ Resales not deducted.

⁴ Figures not complete for commercial plants.

The number of municipal plants is 35.4 per cent of the total for all plants in the United States, but in no other item is so high a percentage shown. It also appears that the number of municipal plants generating all or part of their current is relatively smaller (34.7 per cent) than the number purchasing all current (38.2 per cent). It must be explained, however, that there are a number of plants in either group which have generating equipment, but did not during the year produce any current. Hence the number of central electric stations reported as purchasing all current is not identical with the number having no generating equipment. It is also interesting to note that commercial plants frequently report on the same schedule a number of separate generating stations which are operated as part of the single system. Establishments generating all or part of their current will always be

somewhat smaller in this group than the number of separate generating stations, as is indicated by the figures in the table. For municipal plants, on the other hand, the number of separate generating stations is practically identical with the number of establishments reporting.

In this connection it is of great significance to find that commercial plants, while representing only 64.6 per cent of the total number, serve 82.7 per cent of all municipalities furnished with electric current. This is due to the fact that most commercial stations distribute current directly to consumers throughout an extensive territory, some supplying scores of separate localities, while almost without exception municipal plants serve only the municipalities in which they are located. On the other hand, it must not be forgotten that frequently several commercial plants are located

in the same city, one usually doing a general light and power business, while the others may incidentally do a little lighting, but will in the main supply current only for power or to other companies. There were 405 cases of this kind in 1917. A comparison of the number of commercial plants (4,224) with the number of places served by the same (11,349) discloses the fact that the average plant in this group supplies current in nearly 3 different places. The greatest average number of localities served by single stations is to be found in California, where hydroelectric development is most extensive, and the average plant serves about 9 separate localities. In Pennsylvania, also, a high average of more than 5 localities per plant is found, in New Jersey the average is about 8, and in Rhode Island almost 10, though the actual number of plants is very small (8). Finally, it is interesting to note that, without deducting duplications, commercial plants supply 80.5 per cent of the aggregate population of all districts served with electric current. In making such a comparison, however, it should be remembered that an appreciable number of the larger municipal plants (190) are operating in territory already served by commercial stations, and frequently do only a street lighting business. Hence the relative amount of population actually served would not be so great as the figures given would seem to indicate (19.5 per cent).

So far as the value of plant and equipment is concerned, it is obvious that municipal plants are relatively of slight importance, reporting only 4.2 per cent of the total. In "total income" their position is slightly better, or 7.6 per cent of the total for both groups. They report only 6.6 per cent of the total horsepower of prime movers and only 6.5 per cent of the kilowatt capacity of dynamos, while they generate only 4.1 per cent of all current. Further, it appears that practically all of the output of municipal plants is sold for lighting purposes (13.1 per cent of the total sold for light by both groups) rather than for power or to other public service corporations. The relative number of customers supplied by municipal plants is 13.6 per cent of the total, though it is apparent that the amount of current sold per customer is far lower than in the case of commercial plants. The average rates received by municipal plants for their current are much higher than those charged by the other group, as is indicated by the fact that, while they sell only 4 per cent of all current, they receive 7.9 per cent of the income from the sale of current. More detailed comparisons will be made in other portions of the report.

Isolated electric stations.—While no effort was made in this census to secure data regarding the number and importance of the so-called isolated electric plants—that is, those which do not distribute current to the public, but are operated solely for the owners' use,

usually in connection with manufacturing establishments—yet it may be of public interest to indicate the probable scope of this phase of the electric industry. According to the census of manufactures for 1914 there were in that year 205,590 industrial establishments, or 74.5 per cent of the total, which reported the use of mechanical power of different kinds.¹ The total primary horsepower reported, both owned and rented, was 22,547,574, which, of course, comprises all power which is "primary" from the standpoint of the manufacturing establishments using it. Of this amount, 4,929,967, or 21.9 per cent, consisted of motor horsepower operated by establishments generating their own electric current. This amount of power, represented by 320,260 motors, may be profitably compared with the 435,473 motors, with a total horsepower of 4,130,619, reported by central electric light and power stations in 1912. The number of motors served by the latter, while having a total horsepower 16.2 per cent less than that electrically operated by the manufacturing establishments, was 36 per cent greater. In other words, the average horsepower per motor served was, for central electric stations, 9.5 per cent, and for manufacturing establishments generating their own current, 15.4. Though exact figures are not at present available, yet if it be assumed that the establishments reporting 4,929,967 electrical horsepower owned also represent 21.9 per cent of all establishments using mechanical power, according to this computation there would have been in 1914 about 45,000 isolated plants in the United States operated solely in connection with industrial enterprises. To these, as indicated in Chapter I, there should be added a large but indeterminate number of isolated plants operated by mines, stores, hotels, pleasure resorts, public buildings, and institutions of various sorts, such as schools, colleges, prisons, etc.

Central station work of electric railways.—A number of electric railway companies have, at the different census periods, been engaged in the sale of electric current for light and power. Some of these conduct their central station work as a special department and are therefore able to submit satisfactory schedules for census purposes. The reports from such companies have, of course, been included with those for central stations and they are regarded as composite plants. In 1917, however, there were 160 electric street railway companies which, while doing an extensive electric light and power business, did not keep their accounts in such a way as to be able to furnish complete data to the Census Bureau. Accordingly, in Table 6 a brief separate tabulation has been made of the income of the electric light and power departments of such railway companies.

¹ Abstract of the Census of Manufactures for 1914, pp. 491-493.

Table 6

	ELECTRIC LIGHT AND POWER DEPARTMENTS OF ELECTRIC RAILWAY COMPANIES.			
	1917	1912	1907	Per cent of in- crease: ¹ 1907- 1917.
Number of stations.....	160	169	177	-9.6
Gross income.....	\$54,348,875	\$31,515,582	\$17,291,824	214.3
Electric service.....	\$52,919,886	\$30,984,555	\$16,576,555	219.2
All other sources.....	\$1,428,989	\$531,027	\$715,269	99.8
Stationary motors:				
Number.....	(²)	(²)	20,468	.....
Horsepower.....	(²)	(²)	158,923	.....
Meters on consumption circuits, number.....	(²)	(²)	213,886	.....

¹ A minus sign (—) denotes decrease.² Exclusive of the estimated value of free service, amounting to \$42,734 in 1917 and \$66,051 in 1912.³ Not reported.

From the table it appears that, while there has not been much change in the number of the electric light departments of street railway companies since 1907, there has been a very marked increase in their income from electric service. This income has increased during the decade 219.2 per cent, as opposed to an increase of only 196 per cent for all central electric stations in the United States. At the present time these 160 stations, which comprise only 2.4 per cent of all central electric stations in the United States, report an income of \$52,919,886 from the sale of electric current only, as compared with a central station

income from the same source of \$502,059,980. In other words, they report an income equal to 10.5 per cent of that of the central stations. It is further interesting to find that the average total income of this group is \$339,680, as opposed to an average of only \$80,540 for central electric stations. The estimated value of free service furnished by these electric light and power departments amounted to \$42,734 in 1917, and, in addition, there were more than 200 street railway companies without any light and power departments which report an income from the sale of current amounting to \$6,710,099. This current was sold in part to other electric railway companies, as well as to central electric stations, and to consumers direct for light and power. Accordingly, the total income derived from the sale of electric current by street railways and not included in the income of central stations, including the value of free service, is \$59,672,719, or 10.2 per cent of the central station income. To this should also be added the income of \$1,428,989 from "all other sources," making a total of \$61,101,708.

Comparison of central electric stations and gas plants.—Table 7 shows for the most nearly comparable periods the relative importance of central electric stations and gas plants during the past census decade.

Table 7

	COMPARATIVE SUMMARY—CENTRAL ELECTRIC STATIONS AND GAS PLANTS.										
	General electric stations.			Gas plants.			Per cent of increase. ¹				
							Central electric stations.		Gas plants.		
	1917	1912	1907	1914	1909	1904	1907- 1917	1912- 1917	1907- 1912	1904- 1914	1909- 1914
Number of establishments.....	6,542	5,221	4,714	1,284	1,296	1,019	38.8	25.3	10.8	26.0	-0.9
Value of plant and equipment.....	\$3,060,322,141	\$2,175,678,266	\$1,096,913,622	\$1,252,421,584	\$915,536,762	\$725,085,204	179.0	40.7	98.3	72.7	36.8
Gross income ²	\$526,894,240	\$302,273,398	\$175,642,338	\$220,237,790	\$166,814,371	\$125,144,945	200.0	74.3	72.1	76.0	32.0
From sale of electric current or gas.....	\$502,059,980	\$287,138,657	\$169,614,991	\$175,065,920	\$138,615,309	\$112,662,568	196.0	74.8	69.3	65.4	26.3
From all other sources.....	\$24,834,260	\$15,134,741	\$6,027,347	\$45,171,870	\$28,199,062	\$12,482,377	312.0	64.1	151.1	261.9	60.2
Total number of persons employed.....	105,541	79,335	47,632	63,915	50,730	39,972	121.6	33.0	66.6	59.9	26.0

¹ A minus sign (—) denotes decrease.² Capital invested—owned and borrowed.³ Exclusive of the income reported by the electric light and power departments of electric railways, as follows: In 1917, \$54,348,875; in 1912, \$31,515,582; and in 1907, \$17,291,824.

It will be observed that, while the rate of increase in investment during the latest five-year period has been about the same for electric light and power plants (40.7 per cent) as for gas plants (36.8 per cent), the rate of increase in gross income has been considerably more than twice as rapid for the former. On the other hand, there has not been much disparity between the two industries in the rate of increase of the total number of persons employed. The number of gas plants actually decreased slightly between 1909 and 1914, whereas there was an increase of 25.3 per cent between 1912 and 1917 in the number of electric stations, but during the preceding five-year period the former increased much more rapidly than the latter (27.2 as opposed to 10.8 per cent). During the

decade the rate of increase in every item was much more rapid for electric stations than for gas plants, the increase in the income from the sale of electric current being more than three times as rapid as that from the sale of gas. Finally, during each period there has been, in practically every instance, a slight but certain decline in the relative proportion which the gas industry bears to the total for central electric stations and gas plants. The comparatively large amount of income derived from "all other sources" by gas plants is, of course, to be accounted for by the disposal of numerous by-products of this industry.

Commercial and municipal stations combined.—As indicated by Table 8, the growth in importance during

the last decade of the electric light and power industry has been far in excess of the increase in the number of separate plants. The actual numerical increase—1,321 between 1912 and 1917 and 507 between 1907 and 1912—is by no means identical with the number of new stations which have been installed, since many of the plants reporting at one census are in the meantime combined with other plants, while frequently even new stations are merged with others, new or old, before they have been established long enough to make the report for the census. It is, however, interesting to find that the number has increased much more rapidly (25.3 per cent) during the latest

five-year period than during the preceding period 1907–1912, when the rate of increase was only 10.8 per cent. For both periods, also, the numerical increase has been considerably more rapid for municipal plants. Those important items which show the greatest increase for the decade are: "Value of plant and equipment" (179 per cent), "total income" (200 per cent), "expense" (217.9 per cent), "total horsepower of prime movers" (215.7 per cent), "kilowatt capacity of dynamos" (232 per cent), "kilowatt hours generated" (333.9 per cent), "number of customers" (268.7 per cent), and "horsepower of stationary motors served" (458.9 per cent).

Table 8

	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS.					
	1917	1912	1907	Per cent of increase. ¹		
				1907–1917	1912–1917	1907–1912
Number of stations ²	6,542	5,221	4,714	38.8	25.3	10.8
Commercial.....	4,224	3,659	3,462	22.0	15.4	5.7
Municipal.....	2,318	1,562	1,252	85.1	48.4	24.8
Value of plant and equipment.....	\$3,060,392,141	\$2,175,678,266	\$1,096,913,622	179.0	40.7	98.3
Total income ³	\$526,894,240	\$302,273,398	\$175,642,338	200.0	74.3	72.1
Light, heat, and power, including free service.....	\$502,059,980	\$287,188,657	\$169,614,691	196.0	74.8	69.3
All other sources.....	\$24,834,260	\$15,134,741	\$6,027,647	312.0	64.1	151.1
Total expenses, including salaries and wages ⁴	\$426,568,307	\$234,677,277	\$134,196,911	217.9	81.8	74.8
Total number of persons employed.....	106,541	79,335	47,632	121.6	33.0	66.6
Prime movers:						
Number.....	13,795	11,902	10,998	25.4	15.9	8.2
Total horsepower.....	12,936,755	7,530,044	4,068,188	215.7	71.8	83.7
Dynamos:						
Number.....	13,428	12,610	12,173	10.3	6.5	3.6
Kilowatt capacity.....	8,994,407	5,165,439	2,709,225	232.0	74.1	90.7
Output of stations:						
Kilowatt hours generated.....	25,438,808,272	11,569,109,885	5,862,276,737	333.9	119.9	97.3
Kilowatt hours purchased.....	5,606,746,962	2,613,502,605	(⁵)	—	114.5	—
Number of street lamps:						
Arc.....	256,950	348,643	(⁵)	—	-26.3	—
Incandescent and other varieties.....	1,392,284	681,957	(⁵)	—	104.2	—
Stationary motors served:						
Number ⁷	555,924	435,473	167,184	232.5	27.6	180.5
Horsepower capacity.....	9,216,330	4,130,619	1,649,026	458.9	123.1	150.5
Number of customers.....	7,178,703	3,837,518	1,946,979	268.7	87.1	97.1

¹ A minus sign (—) denotes decrease.

² The term "station" as here used may represent a single electric station or a number of stations operated under the same ownership.

³ Exclusive of \$59,629,985 in 1917, \$36,500,630 in 1912, and \$20,063,302 in 1907 reported by electric railway companies as income from sale of electric current for light or power or from sale of current to other public service corporations.

⁴ In addition to salaries and wages, includes the cost of supplies and materials used for ordinary repairs and replacement, advertising, fuel, mechanical power, electrical energy purchased, taxes, charges for depreciation, and all other expenses incident to operation and maintenance.

⁵ Not reported.

⁶ Figures not available.

⁷ In 1917, 41 stations failed to report the number of their motors.

To refer to certain items more specifically, it appears that there has been a marked falling off in the rate of increase in investment during the latest five-year period, from 98.3 per cent to only 40.7 per cent, though there has not been so much difference in the absolute increase. This condition is to be expected as the business becomes more widely established. Also, the abnormally high cost of materials and equipment of all kinds during the last two or three years of the period no doubt acted as a real check on capital expenditures. The rate of increase in the total income (74.3 and 72.1 per cent, respectively) has been almost identical during the two five-year periods, while total expenses have increased somewhat more rapidly (81.8 and 74.8 per cent, respectively). The number of employees increased only half as rapidly (33 per cent) between 1912 and 1917 as between 1907 and 1912. These figures would indicate a much greater efficiency of labor at the

present time—a fact which is no doubt in the main accounted for by the development of larger scale productive units in the industry. While the total horsepower of prime movers and the kilowatt capacity of dynamos have at each period shown an increase commensurate with the growth in income, the total number of units in each case has remained almost unchanged, though there has been an actual decrease of considerable proportions in the number of steam engines and a marked increase in the number of internal-combustion engines. There has, further, been a gratifying increase in the amount of current generated, 119.9 per cent from 1912 to 1917, and 97.3 per cent from 1907 to 1912. As this increase has been much more rapid than the increase of income, it is evident that customers are progressively securing their light and power at lower rates. In this connection, also, the fact that the number of customers has been increasing far more rapidly (87.1 per cent in the later

period and 97.1 per cent at the earlier date) than the number of stations and the income from the sale of current no doubt suggests that more people are being reached directly from a given center of distribution and that the business per customer is less than formerly. Finally, while not much significance can be attached to the apparent rate of increase in the number of stationary motors served, because of the fact that some very important plants failed to make

complete returns in 1917, yet the unusually marked increase in the capacity of these motors indicates the continually growing utilization of electrical power in industry.

Commercial central electric stations.—Table 9 shows for commercial stations taken separately the importance of the leading items secured for census purposes for the years 1917, 1912, and 1907, together with the per cent of increase in the different items.

Table 9.

	COMMERCIAL CENTRAL ELECTRIC STATIONS.					
	1917	1912	1907	Per cent of increase. ¹		
				1907-1917	1912-1917	1907-1912
Number of stations.....	4,224	3,659	3,462	22.0	15.4	5.7
Value of plant and equipment.....	\$2,933,016,941	\$2,068,613,122	\$1,054,034,175	178.3	39.8	99.1
Total income.....	\$486,634,021	\$279,064,409	\$161,630,339	201.1	74.4	72.6
Light, heat, and power, including free service.....	\$462,473,917	\$264,474,949	\$156,000,257	196.4	74.9	69.5
All other sources.....	\$24,160,104	\$14,579,460	\$5,630,082	329.1	65.7	159.0
Total expenses, including salaries and wages ²	\$396,127,395	\$217,660,112	\$123,880,291	219.0	81.5	75.7
Total number of persons employed.....	94,679	71,395	42,066	125.1	32.6	69.7
Prime movers:						
Number.....	10,387	9,326	8,981	15.6	11.4	3.8
Total horsepower.....	12,077,657	6,970,716	3,776,837	219.8	73.3	84.6
Dynamos:						
Number.....	9,991	9,843	9,778	2.2	1.5	0.7
Kilowatt capacity.....	8,411,944	4,768,762	2,500,209	236.4	76.4	90.7
Output of stations:						
Kilowatt hours generated.....	24,398,963,183	11,031,583,155	5,572,813,949	337.8	121.2	98.0
Kilowatt hours purchased.....	5,413,207,563	2,524,922,228	(³)	.....	114.4	.....
Number of street lamps:						
Arc.....	206,957	264,162	(³)	.....	-21.7	.....
Incandescent and other varieties.....	969,709	474,488	(³)	.....	104.4	.....
Stationary motors served:						
Number.....	504,364	413,578	162,677	210.3	22.1	154.2
Horsepower capacity.....	8,790,707	3,986,328	1,617,337	443.5	121.6	145.2
Number of customers.....	6,202,189	3,311,870	1,663,354	272.9	87.3	99.1

¹ A minus sign (—) denotes decrease.

² In addition to salaries and wages, includes the cost of supplies and materials used for ordinary repairs and replacement, advertising, fuel, mechanical power, electrical energy purchased, taxes, charges for depreciation, and all other expenses incident to operation and maintenance.

³ Not reported.

⁴ Figures not available.

The numerical increases shown in the various periods—565 between 1912 and 1917 and 197 between 1907 and 1912—do not disclose to the casual student of the problem the actual conditions which exist so far as the number of commercial central electric stations are concerned. While figures are not available for 1912, a careful analysis of the schedules for 1917 reveals the fact that 1,593 plants, of which 1,568 were newly constructed and 25 had been transferred from municipal to commercial ownership, made returns at this date which did not report in 1912. It further appears that of the 1,028 commercial stations reporting in 1912 but not in 1917, 711 were combined with other commercial lighting plants, 9 with municipal plants, 8 with street railways, and 131 changed from commercial to municipal ownership, while the remaining 99 were not, so far as could be ascertained, operated in 1917, though it is probable that a large portion may have been absorbed by other plants. These figures are significant as showing the rapid growth in number of new commercial plants as well as the marked tendency toward combination in this industry. The number of stations constructed between 1912 and 1917 was 42.9 per cent of the total

number reporting at the earlier date, and, had there been no combinations with other commercial companies of some kind, the net increase would have been at least 37 per cent. It is also interesting to note in this connection that 99 commercial plants do no general lighting business. Five of these furnish current only for street or park lighting, while the remaining 94 sell practically all of their current in bulk to other public service corporations and sometimes do a certain amount of power business. Finally, 877 plants, or 20.8 per cent of the total, as contrasted with 439 in 1912, generated no current during the year, though a few of them still retained their generating equipment.

The greatest number of commercial plants is to be found in the West North Central division, where the increase since 1912 has been 292, until at present there are 970 plants. The East North Central group follows, with 818 plants, while the Pacific division is at the bottom of the list, with 206. In the New England division there has been no change whatever in number, while the Middle Atlantic shows a decrease of 11 and the Pacific a decrease of 5. All other divisions have had increases ranging from 32 to 90

plants. Of the separate states, 4 have between 200 and 300 commercial plants, New York heading the list with 277, while Pennsylvania, Texas, and Missouri follow, with 232, 230, and 206, respectively. There are 11 other states which have between 100 and 200 plants. In 12 states, as a result of combinations, there has been an actual decrease in the number of plants to the extent of 18 in California and 9 in New Jersey and Colorado, with less marked decreases in the remaining. Ohio reports the same number at both periods. Finally, those states showing the greatest increase in number are Missouri (81), North Dakota (68), Nebraska (36), North Carolina (33), Minnesota (31), South Dakota (31), and Kentucky (30), most of which were not so well supplied relative to their population in 1912. There were, in 1917, 60 companies having their generating stations in one state and distributing a portion or all of their current in adjacent states. In a few of these cases it was necessary for the purposes of this census to regard that portion of the plant and equipment located in an adjoining state as if it were a separate plant. The only important instances of this sort were between West Virginia and Ohio and Oregon and Washington.

Probably little need be said regarding the increases in the various items shown for commercial stations separately, since, as indicated in Table 5, this group of plants does the bulk of the central station business in the United States. Hence, most of the explanations in connection with Table 8, covering both commercial and municipal plants in the United States, will also apply to the commercial plants alone. Perhaps, however, attention should be paid to the

fact that during the decade the total number of dynamos has increased 2.2 per cent, while the kilowatt capacity has increased by 236.4 per cent, or more than one hundred times as rapidly. This fact, taken in connection with the 22 per cent growth in the number of stations, indicates that not only have increasingly large generating units been installed by the newer plants but also old equipment has been rapidly discarded. It is further significant that a similar tendency exists in connection with the primary power equipment, in which the increase in capacity has been 219.8 per cent between 1907 and 1917, while the increase in the number of units has been only 15.6 per cent. These figures, however, are not so striking as in the case of statistics relating to the dynamos. Finally, the number of kilowatt hours generated has increased much more rapidly during the latest five-year period (121.2 per cent) than during the preceding period (98 per cent), while the rate of increase for the decade (337.8 per cent) has been far in excess of the increased capacity of dynamos. These figures, of course, point to a much more efficient utilization of generating equipment than at earlier dates.

Commercial stations classified according to character of ownership.—It is worth while to make some comparisons of commercial stations based on the character of ownership. As has been previously indicated, the census calls for a classification of plants in this group according to whether they are owned by individuals, firms, or corporations. In Table 10, accordingly, some of the more important relations existing between these various classes are set forth.

Table 10

COMMERCIAL CENTRAL ELECTRIC STATIONS, BY CHARACTER OF OWNERSHIP: 1917 AND 1912.

	Total.		Individual.		Firm.		Incorporated. ¹		Per cent of increase ²			
	1917	1912	1917	1912	1917	1912	1917	1912	Total.	Individual.	Firm.	Incorporated.
Number of stations.....	4,224	3,659	909	587	397	293	2,918	2,779	15.4	54.8	35.5	5.0
Total income.....	\$486,634,021	\$279,054,409	\$3,416,952	\$2,931,706	\$1,805,001	\$1,575,096	\$481,412,068	\$277,547,607	74.4	16.6	14.6	75.3
Light, heat, and power.....	\$462,473,917	\$264,474,949	\$3,347,507	\$2,812,178	\$1,766,514	\$1,517,129	\$457,359,896	\$260,145,642	74.9	19.0	16.4	75.8
All other sources.....	\$24,160,104	\$14,579,460	\$69,445	\$119,528	\$38,487	\$57,967	\$24,062,172	\$14,401,965	65.7	-41.9	-33.6	67.0
Total expenses, including salaries and wages.....	\$395,127,395	\$217,660,112	\$2,691,060	\$2,155,032	\$1,375,763	\$1,109,031	\$391,060,572	\$214,396,049	81.5	24.9	24.0	82.4
Total number of persons employed.....	94,679	71,395	1,101	1,097	591	576	92,987	69,722	32.6	0.4	2.6	33.4
Prime movers:												
Number of units.....	10,387	9,326	1,257	899	586	465	8,544	7,992	11.4	44.6	26.0	6.9
Total horsepower.....	12,077,657	6,970,716	79,476	87,455	48,113	48,404	11,950,069	6,834,857	73.3	-9.1	-0.6	74.8
Steam engines (including turbines)—												
Number.....	5,287	5,823	826	479	168	255	4,793	5,089	-9.2	-32.0	-34.1	-5.8
Horsepower.....	7,852,206	4,543,112	32,056	57,234	18,906	29,717	7,801,244	4,456,161	72.8	-44.0	-36.4	75.1
Water wheels—												
Number.....	3,109	2,670	229	198	122	100	2,758	2,372	16.4	15.6	22.0	16.3
Horsepower.....	4,076,878	2,338,970	24,754	22,141	18,083	14,151	4,084,041	2,302,678	74.3	11.8	27.8	75.2
Internal-combustion engines—												
Number.....	1,991	883	702	192	296	110	993	531	139.0	265.6	169.1	87.0
Horsepower.....	148,574	88,634	22,665	8,080	11,125	4,536	114,784	76,018	67.6	180.5	145.3	51.0
Dynamos:												
Number.....	9,991	9,843	1,171	861	528	401	8,292	8,581	1.5	36.0	31.6	-3.4
Kilowatt capacity.....	8,411,944	4,768,762	50,951	60,023	29,307	29,577	8,331,686	4,679,162	76.4	-15.1	-0.9	78.0
Output of stations:												
Kilowatt hours generated.....	24,398,983,183	11,031,583,155	52,992,568	60,058,813	45,439,508	37,851,228	24,300,551,107	10,933,573,114	121.2	-11.8	19.7	122.2
Kilowatt hours purchased.....	5,413,207,563	2,524,922,268	7,687,970	3,013,190	4,587,703	1,917,149	5,400,931,890	2,519,991,889	114.4	155.1	139.3	114.3
Number of customers.....	6,202,189	3,311,870	92,995	71,448	49,437	41,455	6,059,757	3,198,967	87.3	30.2	19.2	89.4

¹ In 1917 includes 6 stations classed as "other forms of ownership," and in 1912, 7 such stations.² A minus sign (—) denotes decrease.

Perhaps attention should first be called to the marked increase in the number of plants operated by individuals and firms during the period 1912-1917, amounting to 426, as opposed to an increase of only 139 for corporations, or 75.4 per cent of the aggregate increase in the number of commercial plants. Hence it appears that by far the greater part of the new plants erected have been absorbed by already existing corporations. The rate of increase amounted to 54.8 per cent for individual plants and 35.5 per cent for the firms, while for incorporated plants the increase was only 5 per cent. It should further be noted that between 1907 and 1912 there was an actual decrease in the number of individual plants and firms.

The marked increase in number since 1912 was scarcely to be expected and is not readily accounted for. It is probably true, however, that many plants beginning operation without incorporation, which would normally become incorporated during the period, have retained their original form of organization with a view to avoiding certain Federal and local taxes, a situation which would not have existed in normal times. Further, it may be that a number of small stations have given up their charters and are operating as firms at the present time for similar reasons. Again, judging by the remarkably great increase in the number and horsepower of internal-combustion engines in these plants, together with the marked decrease in the number and horsepower of steam engines and turbines, in many districts it may have been found profitable, as the cost of coal was rising, to establish those small plants which are easily operated by gas and oil engines, with a view to supplying electrical current to a population which had not been previously served. Further, because of the greatly increased cost of copper and all equipment needed for the extension of lines, many large plants, which would normally have extended their operations into more or less distant territory, have found it unprofitable to do so, with the result that the establishment of lighting plants by small interests in connection with some other business has been greatly fostered. Finally, mention should be made of the fact that these

forms of ownership are by far the most common in the West North Central division, comprising the states of Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas, where distances between population centers are frequently great, large central stations are not numerous, coal can not be economically supplied, and there is little opportunity for hydroelectric development. In a number of these states both oil and natural gas are readily accessible. The individual and firm ownership is also common in the West South Central division, where the conditions are in many ways similar to those found in the West North Central division, and where, in addition, there is throughout a large and cheap supply of oil and natural gas. Finally, in the more populous states of Ohio, Illinois, Michigan, and New York are found a relatively large number of these plants, the greatest number being in Ohio and Illinois, where there is a good supply of either gas or oil and where bituminous coal is comparatively low in price.

A further examination of the table discloses the fact that the increase in the leading items for individual plants and firms has by no means kept pace with the increase in the number of such stations. In fact, in a number of cases there has been an actual decrease. The total horsepower of prime movers was less for both classes in 1917 than in 1912, though the number of units had increased by a very appreciable amount, 44.6 per cent for individual plants and 26 per cent for firms. Again, there was a decrease of 15.1 per cent in the kilowatt capacity of dynamos in the former and a decrease of 11.8 per cent in the number of kilowatt hours generated, in spite of the 54.8 per cent increase in the number of plants. On the other hand, the amount of current purchased in both cases increased rapidly. In all important respects, however, individuals and firms, in the aggregate, have grown relatively far less important in the electrical industry than they were at earlier periods.

The relative conditions of commercial plants, according to the character of ownership, are clearly shown in Table 11.

Table 11

	COMMERCIAL CENTRAL ELECTRIC STATIONS—AVERAGES PER PLANT FOR 1917, AND PER CENT OF TOTAL ACCORDING TO CHARACTER OF OWNERSHIP FOR 1917 AND 1912.								
	Average per plant, 1917.			Per cent of total.					
	Individual.	Firm.	Incorporated.	Individual.		Firm.		Incorporated.	
				1917	1912	1917	1912	1917	1912
Number of stations.....				21.5	16.0	9.4	8.0	69.1	76.0
Income.....	\$3,750	\$4,547	\$164,980	0.7	1.0	0.4	0.6	98.9	98.4
Horsepower of prime movers.....	87	121	4,095	0.7	1.3	0.4	0.7	98.9	98.0
Kilowatt capacity of dynamos.....	66	74	2,855	0.6	1.3	0.3	0.6	99.0	98.1
Kilowatt hours generated.....	58,297	114,457	8,327,811	0.2	0.5	0.2	0.3	99.6	99.1
Number of customers.....	102	125	2,077	1.5	2.2	0.8	1.3	97.7	96.6

It appears that the average income of incorporated stations was, in 1917, \$164,980, between forty and fifty times as great as the average income of individual plants, \$3,759; nor did the firms average much larger than the other group of plants. The averages which show the least difference are those for number of customers served, the figures for which were 102 and 125 for individuals and firms, respectively, and 2,077 for corporations. The widest difference, however, is to be found in the number of kilowatt-hours generated, which averages 8,327,811 for incorporated plants, an amount which is nearly seventy-three times as great as that generated by the average firm, and more than one hundred and forty times as great as that produced by the average plant under individual ownership. The table further shows that the relative importance of these smaller stations as com-

pared with the incorporated plants has in all respects grown less during the past five years, and that the two together do only from less than 1 to 2.3 per cent of the entire electric station business of the country.

Municipal central electric stations.—It is of some interest to make a separate study of the general growth of municipal central electric stations. From Table 12 it appears that the rate of increase in the number of stations and in the investment in plant and equipment has been more marked during the decade than for the commercial plants. From 1912 to 1917, particularly, the number of plants increased almost as rapidly as the total investment (48.4 per cent and 65.3 per cent, respectively), whereas at both periods the growth in the investment in commercial plants has far outrun the increase in the number of stations.

Table 12

	MUNICIPAL CENTRAL ELECTRIC STATIONS.					
	1917	1912	1907	Per cent of increase. ¹		
				1907-1917	1912-1917	1907-1912
Number of stations.....	2,318	1,562	1,252	85.1	48.4	24.8
Value of plant and equipment.....	\$127,375,200	\$77,065,144	\$42,879,447	197.1	65.3	79.7
Total income.....	\$40,280,219	\$23,218,989	\$14,011,999	187.8	78.4	65.7
Light, heat, and power, including free service.....	\$39,586,063	\$22,663,708	\$13,614,434	190.8	74.7	66.5
All other sources.....	\$674,156	\$555,281	\$397,565	69.6	21.4	39.7
Total expenses, including salaries and wages ²	\$31,440,912	\$16,917,165	\$10,316,620	204.8	85.8	64.0
Total number of persons employed.....	10,862	7,940	5,566	95.1	36.8	42.7
Prime movers:						
Number.....	3,408	2,576	2,017	69.0	32.3	27.7
Total horsepower.....	859,098	559,328	321,351	167.3	53.6	74.1
Steam engines and steam turbines—						
Number.....	2,200	2,024	1,786	23.2	8.7	13.3
Horsepower.....	596,871	406,666	284,922	109.5	46.8	42.7
Water wheels—						
Number.....	265	269	153	73.2	—1.5	75.8
Horsepower.....	200,395	130,261	33,347	560.3	53.8	329.2
Internal-combustion engines—						
Number.....	943	283	78	916.6	233.2	268.3
Horsepower.....	61,832	22,401	6,082	176.0	176.0	268.3
Dynamoes:						
Number.....	3,437	2,767	2,395	43.5	24.2	15.5
Kilowatt capacity.....	582,463	396,677	209,016	178.7	46.8	89.8
Output of stations:						
Kilowatt hours generated.....	1,039,320,069	537,626,730	239,462,788	259.1	93.4	85.7
Kilowatt hours purchased.....	192,538,399	88,580,377	(³)	117.4	117.4	—
Number of street lamps:						
Arc.....	49,993	84,491	(⁴)	—	—40.8	—
Incandescent and other varieties.....	422,575	207,469	(⁴)	—	103.7	—
Stationary motors served:						
Number.....	51,060	21,895	4,507	1,032.9	133.2	385.8
Horsepower capacity.....	425,623	164,291	31,689	1,243.1	159.1	418.4
Number of customers.....	976,514	525,648	283,625	244.3	85.8	85.3

¹ A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

² In addition to salaries and wages, includes cost of supplies and materials used for ordinary repairs and replacement, advertising, fuel, mechanical power, electrical energy purchased, taxes, charges for depreciation, and all other expenses incident to operation and maintenance.

³ Not reported.

⁴ Figures not available.

It is interesting also to examine in somewhat more detail the increase in number of municipal plants between 1912 and 1917. Accordingly, from Table 13 it appears that the number of new stations installed since 1912 was 728, or 46.6 per cent of the total number reporting in 1912, and, in addition, 131 plants changed from commercial to municipal ownership during the period. This would indicate a total increase of 859 plants. From this number, however, must be deducted 25 municipal stations which changed to commercial ownership, 72 which combined with other plants or with street railways, and 6 which appear to have been out of business or not operated in

1917. This makes a total deduction of 103 plants, leaving an actual numerical increase of 756. It should be further noted that in order to make itemized figures for 1917 comparable with the data given in 1912, certain explanations are needed. Of the municipal plants which have been combined with other plants, 25 were combined with commercial stations and 9 with street railways, making a total of 34 which should be added to those changed from municipal ownership in 1912 to commercial ownership in 1917. This gives us a figure of 59 changes in ownership, more or less comparable with the 80 plants which, between 1907 and 1912, changed from municipal to

private ownership. Also, of the total number combined with other plants the remaining 38 were united with municipal stations. For comparative purposes these may properly be considered with the 6 stations active in 1912 but out of business or not operated in 1917. These calculations would give a total of 103 municipal plants which reported separately to the Census Bureau in 1912 but did not so report in 1917, as compared with a total of 97 such plants which reported separately in 1907 but which changed ownership, were combined with other stations, or were not operated in 1912.

Table 13

NUMBER OF MUNICIPAL CENTRAL ELECTRIC STATIONS AND INCREASE, BY GEOGRAPHIC DIVISIONS: 1912 TO 1917.

DIVISION. ¹	Number of stations.			New stations since 1912.	From commercial stations in 1912 to municipal in 1917.	From municipal stations in 1912 to commercial in 1917.	Stations that have been combined with other stations or with street railways since 1912.	Active municipal stations in 1912 that were out of business or not operated in 1917.
	1917	1912	Numerical increase.					
United States.....	2,318	1,562	756	728	131	25	72	6
New England.....	72	57	15	10	6	.....	1	.....
Middle Atlantic.....	123	102	21	19	7	1	3	1
East North Central.....	567	474	93	114	21	6	35	1
West North Central.....	760	399	361	344	49	9	22	1
South Atlantic.....	330	204	126	112	19	1	1	3
East South Central.....	154	128	26	24	10	2	6	.....
West South Central.....	191	122	69	62	13	4	2	.....
Mountain.....	73	39	34	31	6	2	1	.....
Pacific.....	48	37	11	12	.....	.....	1	.....

¹ See p. 18 for states composing the several geographic divisions.

In passing, mention should be made of the fact that, in 1917, 541 municipal plants, or 23.3 per cent of the total, purchased all of their current, as opposed to 136 such plants in 1912. Also, 67 plants did only a street or park lighting business, while 7 others did both a lighting and a small power business for the municipality itself, without having any commercial customers. The most marked increase in the number of municipal stations from 1912 to 1917 has been in the West North Central division—in fact, the increase in this one section (361 plants) was almost equal to that in all other sections combined. There was also an appreciable addition in the South Atlantic division (126), followed by the East North Central (93) and the West South Central (69). The changes from commercial to municipal ownership were also most numerous in these divisions, as well as the changes from municipal to commercial ownership. A large majority of the combinations occurred in the East North Central and West North Central divisions.

In 1917 the West North Central division had 760 municipal plants, or nearly one-third of the total, while this division and the East North Central together reported 57.2 per cent of all municipal stations.

Nine states—Kansas, Nebraska, Ohio, Iowa, Minnesota, Georgia, Illinois, Michigan, and Oklahoma—had more than 100 municipal plants each, Kansas heading the list with 186. All states showed some increase in the number of plants under public ownership except Rhode Island, Connecticut, and Nevada, which experienced no change, and Delaware, which decreased. The greatest individual increases since 1912 are found in Kansas (104), in Nebraska (87), and in Iowa (79), while the states nearest approaching these are Georgia (44), Oklahoma (43), North Carolina (32), Ohio (31), and Minnesota (29).

Finally, it is interesting to find that in 1917 there were 8 states in which the number of municipal stations exceeded the number of commercial stations. This excess is most marked in Georgia, where it is 80, and in Kansas, with an excess of 70. Both Minnesota and Oklahoma have 11 more municipal than commercial plants, while in the remaining states the differences are less marked. In South Carolina there are an equal number of commercial and municipal plants (41).

At first glance it may be somewhat surprising to find so great an increase in the number of municipal plants as compared with commercial plants. It should be remembered, however, that practically all of these new publicly owned plants are very small, and there has been almost no combination among municipal stations. Hence, in general, every numerical increase represents only one station and one new locality served, whereas in the commercial companies an increase of one may mean a union of several stations or systems and a new territory served embracing many separate municipalities, which, without such combination and distribution of current over long distances, would have found it necessary to install local stations or go without electric current entirely. Further, the most rapid increase in the number of municipal plants has taken place in those less densely populated states where for natural reasons there has been comparatively little large-scale production or combination in the industry.

Some of the suggestions made regarding the growth in number, though not in relative importance, of "individual" plants and "firms" will apply to municipal stations as well. In Kansas, Nebraska, Oklahoma, and Ohio oil or natural gas, or both, are widely and profitably used in small stations, while in Georgia it is customary to utilize waste products from the lumber mills, which make a very inexpensive fuel supply. In none of the stations where increases have been numerous, except in North Carolina, was there to be found before 1917 any hydroelectric development of importance, and in many instances it is probable that the municipalities in question could have had no electric service whatever had they not installed their own plants.

Finally, it is no doubt true that, in the period of rapidly rising prices, many small municipalities were induced to invest in electric plants of their own, even though they might have been served by commercial stations, in the hope that they might thereby effect a saving to the community. So far as the more advanced industrial districts are concerned, however, it appears that in them few municipalities have installed generating plants since 1912, but have merely constructed distributing systems and have relied upon adjoining commercial companies to supply them with electric power. The state of Massachusetts is a typical instance of this tendency, in which the 8 municipal plants established since 1912 all purchase their current. The general trend in this direction is further indicated by the fact that, while in 1912 those municipal plants purchasing all their current comprised only 8.7 per cent of the total, the proportion had increased to 23.3 per cent in 1917.

To return to Table 12, a further examination discloses the fact that while between 1912 and 1917, the rate of increase in total income of municipal plants exceeded the increase in investment (73.4 per cent as opposed to 65.3 per cent), the reverse situation existed in the earlier five-year period, during which time the total income increased only 65.7 per cent, while the investment showed a gain of 79.7 per cent. It is also interesting to find that while the rate of increase in expenses lagged somewhat behind the increase in income between 1907 and 1912, during the latest five-year period the expenses increased 85.8 per cent, or absolutely 12.4 per cent more rapidly than the income. This is a much more marked difference than exists in the case of the commercial plants, where the increase in expenses outstripped the income by only 7.1 per cent. It is somewhat surprising to find that, though there was a 65.3 per cent increase in investment between 1912 and 1917, the rate of increase in the total horsepower of prime movers was only 53.6 per cent and in the kilowatt capacity of dynamos 46.8 per cent. As the industry becomes seasoned, it would be normal to expect a much less rapid increase in the investment as compared with the increase in physical capacity of plants, as is the case in the commercial stations, in which the growth in horsepower of prime movers and kilowatt capacity of dynamos was almost twice as rapid between 1912 and 1917 as the increase in investment. Though during the earlier period there was a much closer relation between these three items, it would appear that at present the increases in investment are not resulting in increased capacity of stations. This condition, of course, is partially accounted for by the comparatively rapid growth in those municipal plants which own only a distributing system. These new plants, however, are in the main much smaller than the average municipal plant and would not vitally affect the situation. The number

of kilowatt hours generated has increased 93.4 per cent during the latest period, as opposed to 85.7 per cent at the earlier date. In neither case, however, has the increase been so marked as for the commercial plants. The most marked development has been in the increase in number and capacity of stationary motors served, which during the decade amounted to more than 1,000 per cent. The number of customers has increased at almost identical rates during both periods.

Table 14 shows, for the three periods 1917, 1912, and 1907, the relative importance of commercial and municipal stations so far as the leading items are concerned.

	PER CENT OF TOTAL, COMMERCIAL AND MUNICIPAL STATIONS.					
	Commercial.			Municipal.		
	1917	1912	1907	1917	1912	1907
Number of stations.....	64.6	70.1	73.4	35.4	29.9	26.6
Value of plant and equipment.....	95.8	96.5	96.1	4.2	3.5	3.9
Total income.....	92.4	92.3	92.0	7.6	7.7	8.0
Light, heat, and power, including free service.....	92.1	92.1	92.0	7.9	7.9	8.0
All other sources.....	97.3	96.3	93.4	2.7	3.7	6.6
Total expenses, including salaries and wages.....	92.6	92.8	92.3	7.4	7.2	7.7
Total number of persons employed.....	89.7	90.0	88.3	10.3	10.0	11.7
Prime movers:						
Number.....	75.3	78.4	81.7	24.7	21.6	18.3
Total horsepower.....	93.4	92.6	92.2	6.6	7.4	7.8
Steam engines and steam turbines.....	92.9	91.8	89.4	7.1	8.2	10.6
Water wheels.....	95.3	94.7	97.8	4.7	5.3	2.2
Internal-combustion engines.....	70.6	79.8	89.1	29.4	20.2	10.9
Dynamos:						
Number.....	74.4	78.1	80.3	25.6	21.9	19.7
Kilowatt capacity.....	93.5	92.3	92.3	6.5	7.7	7.7
Output of stations (total).....	96.0	95.6	(¹)	4.0	4.4	(¹)
Kilowatt hours generated.....	95.9	95.4	95.1	4.1	4.6	4.9
Kilowatt hours purchased.....	96.6	96.6	(¹)	3.4	3.4	(¹)
Number of street lamps:						
Arc.....	80.5	75.8	(¹)	19.5	24.2	(¹)
Incandescent and other varieties..	69.6	69.6	(¹)	30.4	30.4	(¹)
Stationary motors served:						
Number.....	90.8	95.0	97.3	9.2	5.0	2.7
Horsepower capacity.....	95.4	96.0	98.1	4.6	4.0	1.9
Number of meters.....	86.9	87.0	87.2	13.1	13.0	12.8
Number of customers.....	86.4	86.3	85.4	13.6	13.7	14.6

¹ Figures not available.

In the first place, it appears that there has been a steady though not particularly marked increase in the proportionate number of municipal stations, from 26.6 per cent of the total in 1907 to 35.4 per cent in 1917. There has also been a very slight increase in the relative amount of investment in publicly owned plants, from 3.9 per cent in 1907 to 4.2 per cent 10 years later, though there was an unexpected drop to only 3.5 in 1912. Aside from these two items, however, in every vital aspect, except in the horsepower capacity of stationary motors served, the municipal plants have shown a more or less pronounced decrease in the relative importance of their equipment and operations. This proportionate decrease has been most marked in horsepower capacity of prime movers, which dropped from 7.8 per cent of the total for commercial and municipal stations in 1907 to only 6.6 in 1917, and in the kilowatt capacity of dynamos, which decreased from 7.7 per cent to 6.5 per cent during the decade. In the kilowatt hours generated, also,

the decrease has been marked, from 4.9 per cent of the total at the earlier period to only 4.1 in 1917. Even the number of customers has decreased from 14.6 per cent to 13.6 per cent.

Table 15

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGES AND PER CENT OF INCREASE: 1917 AND 1912.

	Commercial.			Municipal.		
	Average per plant.		Per cent of increase.	Average per plant.		Per cent of increase. ¹
	1917	1912		1917	1912	
Value of plant and equipment.....	\$694,370	\$573,548	21.1	\$54,950	\$49,337	11.4
Total income.....	\$115,207	\$76,265	51.1	\$17,369	\$14,865	16.8
Total horsepower.....	2,859	1,905	50.1	371	358	3.6
Kilowatt capacity of dynamos.....	1,991	1,303	52.8	251	254	-1.2
Kilowatt hours generated.....	5,776,274	3,014,918	91.6	448,369	344,127	30.3
Kilowatt hours purchased.....	1,281,536	690,058	85.7	53,062	56,710	46.5
Number of customers.....	1,468	905	62.2	421	337	24.9

¹ A minus sign (—) denotes decrease.

Perhaps Table 15, which shows the average size per commercial and municipal plant in 1917 and 1912, together with the per cent of increase in some of the important items during the period, will aid in showing more clearly just what has been happening comparatively in the electric light and power industry. Accordingly, it appears that the rate of increase in investment per plant has been almost twice as rapid for commercial stations (21.1 per cent) as for municipal stations (11.4 per cent), but it further appears that the total average horsepower has increased almost fourteen times as rapidly in the commercial plants (50.1 per cent as opposed to 3.6 per cent), while comparison is utterly impossible in the case of dynamo capacity, since for the commercial plants there was an increase of 52.8 per cent, while for municipal plants there was an actual decrease of 1.2 per cent. In the number of kilowatt

hours generated, also, the average commercial plant shows an increase of 91.6 per cent, which is more than three times as rapid a rate as the increase of 30.3 per cent shown by the municipal plants. Finally, even in the number of customers, commercial plants have shown an increase two and one-half times as rapid as that of the other group. All these comparisons point to the facts; first, that the average size of commercial plants has increased far more rapidly than that of municipal plants, and, secondly, that the former are apparently doing a much more extensive business relative to their increase in investment.

Purely electric and composite stations contrasted.—It is interesting to make some comparisons between purely electric and composite stations. As indicated in Chapter I, a "composite station" is one which is operated in connection with some other industry which may be more or less important from a financial point of view than the electrical part of the business. Commonly, the operations carried on with that of furnishing electric current are those of supplying water and producing gas or conducting a street railway enterprise. Frequently, however, enterprises not of a public service nature, such as the manufacture of ice, are found in connection with central station activities. The prevailing condition is shown by the following statement:

COMPOSITE PLANTS—CHARACTER OF SERVICE: 1917.

Character of service.	Number of stations.
Electric and water.....	1,328
Electric and gas.....	206
Electric, gas, and water.....	32
Electric, gas, and street railway.....	14
Electric and street railway.....	11
Electric, gas, water, and street railway.....	6
Electric, water, and street railway.....	4
Electric and miscellaneous business, such as heating, manufacture of ice, mining, telephones, etc.....	1,064

PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—COMMERCIAL AND MUNICIPAL: 1917, 1912, AND 1907.

Table 16

	Census year.	Aggregate.	PURELY ELECTRIC STATIONS.			COMPOSITE STATIONS.		
			Total.	Commercial.	Municipal.	Total.	Commercial.	Municipal.
Number of stations.....	1917	6,542	3,877	2,787	1,090	2,665	1,437	1,228
	1912	5,221	2,772	2,209	563	2,449	1,450	999
	1907	4,714	2,648	2,127	521	2,066	1,335	731
Per cent of increase, 1907-1917.....		38.8	46.4	31.0	109.2	29.0	7.6	68.0
Cost of construction and equipment.....	1917	\$3,060,392,141	\$1,733,705,700	\$1,672,794,913	\$60,910,787	\$1,326,686,441	\$1,260,222,028	\$66,464,413
	1912	\$2,175,678,266	\$1,128,330,859	\$1,105,111,379	\$23,219,480	\$1,047,347,407	\$993,501,743	\$53,845,664
	1907	\$1,096,913,622	\$662,926,914	\$639,437,274	\$23,489,640	\$433,986,708	\$414,596,901	\$19,389,807
Per cent of increase, 1907-1917.....		179.0	161.5	161.6	159.3	205.7	204.0	242.8
Total income.....	1917	\$526,894,240	\$306,328,777	\$288,791,787	\$17,536,990	\$220,565,463	\$197,842,234	\$22,723,229
	1912	\$302,273,398	\$159,343,659	\$151,673,537	\$7,670,116	\$142,929,745	\$127,380,872	\$15,548,873
	1907	\$175,642,338	\$107,974,921	\$101,222,267	\$6,752,654	\$67,667,417	\$60,408,072	\$7,259,345
Per cent of increase, 1907-1917.....		200.0	183.7	185.3	159.7	226.0	227.5	213.0
Light, heat, and power.....	1917	\$502,069,980	\$293,696,971	\$276,452,158	\$17,244,813	\$306,363,009	\$186,021,759	\$22,341,250
	1912	\$287,138,657	\$152,751,014	\$145,276,466	\$7,474,548	\$134,387,643	\$119,198,483	\$15,189,160
	1907	\$169,614,691	\$104,629,574	\$98,066,838	\$6,572,736	\$64,985,117	\$57,943,419	\$7,041,698
Per cent of increase, 1907-1917.....		196.0	180.7	181.9	162.4	220.6	221.0	217.3
All other sources.....	1917	\$24,824,260	\$12,631,806	\$12,339,629	\$292,177	\$12,202,454	\$11,820,475	\$381,979
	1912	\$15,134,741	\$6,592,639	\$6,397,071	\$195,568	\$8,542,102	\$8,182,399	\$359,713
	1907	\$6,027,647	\$3,345,347	\$3,165,429	\$179,918	\$2,682,300	\$2,464,653	\$217,647
Per cent of increase, 1907-1917.....		312.0	277.6	289.8	62.4	354.9	379.6	75.5

GENERAL DEVELOPMENT OF THE INDUSTRY.

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PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—COMMERCIAL AND MUNICIPAL: 1917, 1912,
AND 1907—Continued.

Table 16—Continued.	Census year.	Aggregate	PURELY ELECTRIC STATIONS.			COMPOSITE STATIONS.		
			Total.	Commercial.	Municipal.	Total.	Commercial.	Municipal.
Total expenses, including salaries and wages.....	1917	\$426,568,307	\$249,871,295	\$235,602,731	\$14,268,564	\$176,697,012	\$159,524,064	\$17,172,948
	1912	\$224,577,277	\$122,322,345	\$110,574,761	\$5,747,584	\$112,254,932	\$101,085,351	\$11,169,581
	1907	\$134,196,911	\$76,238,087	\$71,411,333	\$4,826,754	\$57,968,574	\$52,408,955	\$5,559,619
Per cent of increase, 1907-1917.....		217.9	227.8	229.9	195.6	204.9	204.0	212.8
Total number of persons employed.....	1917	105,541	58,491	54,004	4,487	47,050	40,675	6,375
	1912	79,335	40,117	37,635	2,482	39,218	32,760	6,458
	1907	47,632	27,524	24,968	2,556	20,108	17,096	3,012
Per cent of increase, 1907-1917.....		121.6	112.5	116.3	75.5	134.0	137.9	111.8
Total horsepower.....	1917	12,936,755	7,966,317	7,552,963	413,354	4,970,438	4,524,094	446,344
	1912	7,530,044	4,006,189	3,881,835	174,354	3,325,855	3,123,951	201,904
	1907	4,098,188	2,473,311	2,324,253	149,058	1,624,577	1,452,544	172,033
Per cent of increase, 1907-1917.....		215.7	222.1	225.0	177.4	205.9	211.5	158.7
Steam engines and steam turbines—								
Number.....	1917	7,487	3,140	2,463	677	4,347	2,824	1,523
	1912	7,847	3,385	2,773	612	4,462	3,060	1,402
	1907	8,054	4,169	3,467	702	3,585	2,801	1,064
Per cent of increase, 1907-1917.....		-7.0	-24.7	-29.0	-3.6	11.9	0.8	40.5
Horsepower.....	1917	8,449,076	5,131,443	4,966,314	265,129	3,317,633	2,985,891	331,742
	1912	4,949,778	2,480,970	2,350,919	130,051	2,459,808	2,182,193	277,615
	1907	2,693,273	1,583,973	1,456,569	127,404	1,109,295	948,782	160,513
Per cent of increase, 1907-1917.....		213.7	224.0	233.4	113.1	199.1	214.7	106.7
Water wheels—								
Number.....	1917	3,374	1,964	1,820	144	1,410	1,299	121
	1912	2,939	1,666	1,557	109	1,273	1,113	160
	1907	2,481	1,575	1,491	84	906	837	69
Per cent of increase, 1907-1917.....		36.0	24.7	22.1	71.4	55.6	54.0	75.4
Horsepower.....	1917	4,277,273	2,727,109	2,604,667	122,442	1,550,164	1,472,181	77,983
	1912	2,469,231	1,454,976	1,429,148	25,828	1,014,255	909,822	104,433
	1907	1,349,067	863,885	842,072	21,813	485,202	476,668	8,534
Per cent of increase, 1907-1917.....		217.0	215.7	209.3	461.2	219.5	206.8	813.8
Internal-combustion engines—								
Number.....	1917	2,984	1,855	1,394	461	1,079	597	482
	1912	1,116	667	555	112	449	278	171
	1907	463	295	262	33	168	123	45
Per cent of increase, 1907-1917.....		533.7	528.8	432.1	1,297.0	542.3	385.4	971.1
Horsepower.....	1917	210,406	107,765	81,932	25,833	102,641	66,622	36,019
	1912	111,035	61,243	51,768	9,475	49,792	26,866	22,926
	1907	55,828	25,448	22,632	2,796	30,330	27,094	3,236
Per cent of increase, 1907-1917.....		276.9	323.5	261.8	823.2	237.8	145.9	996.1
Kilowatt capacity of dynamos.....	1917	8,994,407	5,513,472	5,229,529	283,943	3,480,935	3,182,415	298,520
	1912	5,165,439	2,837,928	2,717,670	120,258	2,327,511	2,051,092	276,419
	1907	2,709,225	1,670,814	1,574,286	96,528	1,088,411	926,923	112,488
Per cent of increase, 1907-1917.....		232.0	230.0	232.2	194.2	235.2	243.7	165.4
Output of stations:								
Kilowatt hours generated ^a	1917	25,438,308,272	16,784,522,183	16,214,874,887	569,647,296	8,653,781,089	8,184,108,296	469,672,793
	1912	11,569,109,885	6,638,342,395	6,479,811,486	158,530,909	4,930,767,490	4,551,771,699	378,995,791
	1907	5,982,276,737	3,880,087,887	3,734,978,340	145,109,547	1,982,188,850	1,837,835,609	144,353,241
Per cent of increase, 1907-1917.....		333.9	332.6	334.1	292.6	336.6	345.3	225.4
Kilowatt hours purchased ^a	1917	5,605,745,962	3,490,340,119	3,419,889,274	70,450,845	2,115,405,843	1,993,318,299	122,087,544
	1912	2,613,502,006	1,756,475,791	1,735,212,315	21,263,476	857,026,514	799,709,913	57,316,601
Per cent of increase, 1912-1917.....		114.5	98.7	97.1	231.3	146.8	152.4	81.4
Number of street lamps: ^a								
Arc.....	1917	256,950	132,638	97,268	35,370	124,312	109,689	14,623
	1912	348,643	163,858	130,179	33,679	134,785	133,973	8,812
Per cent of increase, 1912-1917.....		-26.3	-19.1	-25.3	5.0	-32.7	-18.1	-71.2
Incandescent and other varieties.....	1917	1,392,224	686,425	516,045	170,380	705,859	453,664	252,195
	1912	681,957	299,711	216,570	83,141	382,246	257,918	124,328
Per cent of increase, 1912-1917.....		104.2	129.0	138.3	104.9	84.7	75.9	102.8
Stationary motors served:								
Number.....	1917	555,924	277,130	258,064	19,066	278,794	246,800	31,994
	1912	435,473	241,209	233,311	7,898	194,264	180,267	13,997
	1907	167,184	97,758	95,472	2,286	69,426	67,305	2,121
Per cent of increase, 1907-1917.....		232.5	183.5	170.3	734.0	301.6	267.2	1,340.6
Horsepower capacity.....	1917	9,216,330	5,446,524	5,209,853	176,671	3,769,806	3,530,854	238,952
	1912	4,130,619	2,311,509	2,258,131	53,378	1,819,110	1,708,197	110,913
	1907	1,649,026	1,077,484	1,061,190	16,294	571,542	556,147	15,395
Per cent of increase, 1907-1917.....		458.9	405.5	396.6	984.3	559.6	533.1	1,517.1
Number of customers.....	1917	7,178,703	3,679,513	3,272,756	406,757	3,499,190	2,929,433	569,757
	1912	3,837,518	1,753,626	1,579,146	174,480	2,082,892	1,732,724	350,168
	1907	1,946,979	(b)	(b)	(b)	(b)	(b)	(b)
Per cent of increase, 1907-1917.....		268.7						

^a A minus sign (-) denotes decrease.^b In 1907 no separation was made between current generated and purchased.^c Figures not available for 1907.

From Table 16 it appears that during the last decade purely electric stations, both commercial and municipal, have increased much more rapidly in number than composite stations. It is further significant to note that, while commercial composite stations have shown almost no increase during the decade (only 7.6 per cent) and have actually de-

creased nine-tenths of 1 per cent between 1912 and 1917 (from 1,450 to 1,437), municipal composite plants, on the contrary, have increased 68 per cent in number since 1907. The latter condition is to be expected, since many municipalities find it advantageous to operate an electric light plant in connection with a water-supply system or a gas plant already municipi-

pally owned, thus effecting a considerable saving at times in overhead expenses as a result of combined administration and frequently utilization of the same buildings for different purposes. In practically all of the important items, also, the composite stations of all kinds appear to have experienced an increase often more rapid than that shown by purely electric plants. It must be noted, however, that most of the more marked developments came during the earlier five-year period 1907-1912.

Perhaps the relative importance of composite and purely electric stations, both in the aggregate and according to the character of ownership, can best be shown by Table 17, in which the per cent which each group forms of the total is set forth for the years 1917, 1912, and 1907.

Table 17

		PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—PER CENT OF TOTAL: 1917, 1912, AND 1907.					
		Purely electric stations.			Composite stations.		
		Per cent of aggre- gate.	Per cent of total.		Per cent of aggre- gate.	Per cent of total.	
			Com- mer- cial.	Mun- ici- pal.		Com- mer- cial.	Mun- ici- pal.
Cen- sus year.		Total.			Total.		
Number of stations.....	1917	59.3	71.9	28.1	40.7	53.9	46.1
	1912	53.1	79.7	20.3	46.9	59.2	40.8
	1907	56.2	80.3	19.7	43.8	64.6	35.4
Value of plant and equip- ment.	1917	56.6	96.5	3.5	43.4	95.0	5.0
	1912	51.9	97.9	2.1	48.1	94.9	5.1
	1907	60.4	96.5	3.5	39.6	95.5	4.5
Total income.....	1917	58.1	94.3	5.7	41.9	89.7	10.3
	1912	52.7	95.2	4.8	47.3	89.1	10.9
	1907	61.5	93.7	6.3	38.5	89.3	10.7
Horsepower of prime movers.	1917	61.6	94.8	5.2	38.4	91.0	9.0
	1912	53.2	95.6	4.4	46.8	89.1	10.9
	1907	60.4	94.0	6.0	39.6	89.4	10.6
Kilowatt capacity of dy- namos.	1917	61.3	94.9	5.1	38.7	91.4	8.6
	1912	54.9	95.8	4.2	45.1	88.1	11.9
	1907	61.7	94.2	5.8	38.3	89.2	10.8
Kilowatt hours generated....	1917	66.0	96.6	3.4	34.0	94.6	5.4
	1912	57.4	97.6	2.4	42.6	92.3	7.7
	1907	66.2	96.3	3.7	33.8	92.7	7.3
Kilowatt hours purchased ¹ ..	1917	62.3	98.0	2.0	37.7	94.2	5.8
	1912	67.2	98.8	1.2	32.8	92.1	7.9
Horsepower of stationary motors served.	1917	59.1	96.8	3.2	40.9	93.4	6.6
	1912	56.0	97.7	2.3	44.0	93.9	6.1
	1907	65.3	98.5	1.5	34.7	97.3	2.7
Number of customers ¹	1917	51.3	88.9	11.1	48.7	83.7	16.3
	1912	45.7	90.1	9.9	54.3	83.1	16.9

¹ Figures not available for 1907.

From this table it is evident that the number of purely electric stations has grown relatively greater since 1907, though the proportion which commercial stations bear to the total for this group has decreased. On the other hand, it is apparent that among the composite plants those municipally owned are forming an increasingly high proportion. So far as the different items of importance are concerned, it appears that for practically all periods the purely elec-

tric stations were relatively more important than the other group, but there has been an actual decrease in the relative importance of the former, since 1907, in the value of plant and equipment (from 60.4 to 56.6 per cent), the total income (from 61.5 to 58.1 per cent), and horsepower of stationary motors served (65.3 to 59.1 per cent). None of these decreases, however, are particularly marked, and, since the 1912 proportions are in practically every case considerably lower than those shown for 1907 or 1917, it may be that some large plants which in 1912 reported as composite carried on their businesses separately in 1917 and made a return as purely electric. Doubtless, also, plants were returned as "composite" in 1912 which should properly have been considered "purely electric." It further appears that municipal composite plants are not only more numerous but also have a relatively more important business than have the purely electric plants under the same ownership. Except in the value of plant and equipment and the horsepower of motors served, however, there has been some decrease in the relative importance of the former since 1907. In most respects commercial purely electric plants show a proportionate gain, though slight, over municipal plants in the same group since 1907.

In Table 18 is shown the average size of commercial and municipal plants, according to whether they are purely electric or composite.

Table 18

		PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—AVERAGE PER PLANT: 1917.			
		Purely electric.		Composite.	
		Commer- cial.	Munici- pal.	Commer- cial.	Munici- pal.
Value of plant and equipment.....		\$600,213	\$55,881	\$876,981	\$54,124
Total income.....		\$103,621	\$16,089	\$137,677	\$18,540
Total number of persons employed.....		19	4	28	5
Horsepower of prime movers.....		2,710	379	3,149	363
Kilowatt capacity of dynamos.....		1,876	260	2,215	243
Kilowatt hours generated.....		5,818,039	522,612	5,665,274	382,470
Kilowatt hours purchased.....		1,227,086	64,634	1,537,139	99,420
Horsepower of stationary motors served.....		1,891	162	2,450	203
Number of customers.....		1,174	373	2,039	464

From the data here given it is rather surprising to find that the value of plant and equipment per composite commercial plant (\$876,981) is very much higher than that of the purely electric plant (\$600,213), whereas for municipal plants the figure is somewhat lower for "composite" (\$54,124) than for "purely electric" (\$55,881). Further, the total income of the average composite plant is about one-third larger than that of the purely electric, the number of employees is 47.4 per cent greater (28 as opposed to 19), and the average number of customers is 73.7 per cent greater (2,039 as opposed to

1,174). The number of kilowatt hours generated, however, is slightly less than in the average purely electric station, though the former has a considerable advantage in the kilowatt capacity of dynamos and the horsepower of prime movers. Some of these figures, therefore, warrant the inference that a number of the composite plants in this group found it difficult to make any accurate segregation of some of the items required by the schedule, and that consequently operations other than those of electric plants are covered. The relatively low income, as compared with the number of kilowatt hours generated by the purely electric stations, is accounted for by the fact that in this group are included practically all of those large hydroelectric plants which sell most of their current in bulk to other companies. So far as the municipal composite plants are concerned, it appears that while they produce on the average much less current than do purely electric stations in this group, yet they have an appreciably higher income and a larger number of customers. They also appear to be purchasing much

more current in proportion to the total amount of business done.

Stations purchasing all current.—At the census of 1917 for the first time an attempt was made to show separately some of the chief items for purchasing plants. From Table 19 it appears that the number of such central stations amounts to 1,418, or 21.7 per cent of the total, whereas in 1912 the number was only 575, or 11 per cent of all stations. In the other important items this group of stations makes a far less favorable showing, and, as might be expected, since there is no investment in generating equipment, the value of plant and equipment bears a very small ratio (only 3.5 per cent) to the total value for all plants. The next lowest item is the number of kilowatt hours purchased, which forms only 4 per cent of the total output of all stations, though it amounts to 22.1 per cent of *all* purchased current. As compared with the amount of business done, these plants serve a larger number of customers, or 8.4 per cent of the total.

Table 19

CENTRAL ELECTRIC STATIONS PURCHASING ALL CURRENT: 1917.						
	Per cent of all stations.	Total.	Commercial.	Municipal.	Average per station.	
					Commercial.	Municipal.
Number of stations.....	21.7	1,418	877	541		
Value of plant and equipment.....	3.5	\$107,998,564	\$85,350,128	\$22,618,436	\$97,321	\$41,809
Income.....	6.1	\$31,924,380	\$25,625,957	\$6,298,423	\$29,220	\$11,642
Expenses.....	6.1	\$26,124,346	\$21,159,027	\$4,965,319	\$24,127	\$9,178
Kilowatt hours purchased.....	4.0	1,236,670,848	1,074,545,276	162,125,572	1,225,251	299,678
Number of customers.....	8.4	602,846	463,189	139,657	528	258
Number of persons employed.....	5.6	5,875	4,419	1,456	5	3

¹ Per cent of total output.

The averages per plant are in several respects highly interesting. For commercial stations the average value of plant and equipment is found to be \$97,321, or about one-seventh of the average for *all* commercial plants.¹ The average number of kilowatt hours purchased, 1,225,251, is about one-sixth of the average output for all commercial central stations, the average income of \$29,220 is about one-fourth, while the average number of customers, 528, is more than one-third that of the total, 1,468, for this ownership group. The municipal plants, on the other hand, make a relatively much better showing, since the average value of plant and equipment is \$41,809, or a little more than three-fourths that of all municipal stations (\$54,950), while the average income (\$11,642) and the average output of current (299,678 kilowatt hours) are about two-thirds of the average for all plants in this ownership group. The average number of customers, however, is 258, or 61.3 per cent of the total average.¹

As compared with the average commercial purchasing stations, it appears that the average municipal station has a value of plant and equipment 43 per cent as great, receives an income equal to 39.8 per cent of the former, distributes 24.5 per cent as much current, and serves nearly half as large a body of customers. This, of course, indicates a smaller amount of business per customer and relatively much higher rates. Other aspects of these groups of plants will be discussed in another connection. (See Chapter VI.)

Relation of central stations to population.—While an attempt has been made for this census to show more clearly the relations existing between the population of districts served and extent of central station activity than was heretofore possible, it will be interesting first of all to make certain general comparisons with former censuses. Accordingly, Table 20 shows the relation of some of the more important items to the population in the United States at the various periods.

¹ See Table 15, p. 30.

Table 20

DIVISION. ¹	Census year.	CENTRAL ELECTRIC STATIONS—RELATION OF LEADING ITEMS TO POPULATION, BY GEOGRAPHIC DIVISIONS: 1917, 1912, AND 1907.											
		Population. ²	Number of establish- ments.			Horsepower of prime movers.		Kilowatt capacity of dynamos.		Kilowatt hours gener- ated.		Customers.	
			Total.	Com- mercial.	Munic- ipal.	Amount.	Per 1,000 popu- lation.	Amount.	Per 1,000 popu- lation.	Amount.	Per 1,000 popu- lation.	Number.	Per 1,000 popu- lation.
United States.....	1917	103,635,306	6,542	4,224	2,318	12,936,755	125	8,994,407	87	25,438,303,272	245,460	7,178,708	69
	1912	95,545,336	5,221	3,659	1,562	7,530,044	79	5,165,439	54	11,569,109,885	121,085	3,837,518	40
	1907	87,455,366	4,714	3,462	1,252	4,006,188	47	2,709,225	31	5,862,276,737	67,032	1,946,979	22
North Atlantic.....	1917	29,388,344	1,062	867	195	4,747,180	162	3,280,911	112	9,494,901,835	323,084	2,171,151	74
	1912	26,946,884	1,037	878	159	2,748,561	102	1,893,700	70	4,413,964,747	163,808	1,186,183	42
	1907	24,505,429	1,070	920	150	1,534,586	63	1,054,528	43	2,483,106,227	101,329	682,712	24
South Atlantic.....	1917	13,473,354	728	398	330	1,104,746	82	735,619	54	1,745,295,143	129,537	357,577	26
	1912	12,586,582	512	306	204	624,780	50	415,529	33	729,896,397	57,990	196,909	15
	1907	11,699,773	390	232	158	296,265	25	195,309	17	266,437,175	22,773	93,471	8
North Central.....	1917	32,483,936	3,115	1,788	1,327	4,011,747	123	2,869,687	88	7,533,625,656	231,918	2,944,342	91
	1912	30,683,662	2,337	1,464	873	2,292,749	75	1,608,700	52	3,240,559,539	105,612	1,477,923	48
	1907	28,883,390	2,065	1,368	727	1,219,916	42	805,012	28	1,462,114,001	50,621	722,155	25
South Central.....	1917	19,467,806	1,046	701	345	857,275	44	608,907	31	1,581,460,633	78,666	577,270	30
	1912	17,890,901	837	587	250	449,294	25	308,411	17	461,612,464	25,802	355,716	20
	1907	16,313,992	679	513	166	244,422	15	165,969	10	257,387,610	15,777	187,853	12
Western.....	1917	8,821,866	591	470	121	2,215,807	251	1,498,983	170	5,133,020,008	581,852	1,128,363	128
	1912	7,437,327	498	422	76	1,414,660	190	939,099	126	2,723,056,738	365,134	673,538	91
	1907	6,062,782	480	429	51	803,999	133	488,407	81	1,363,231,724	230,180	360,787	60

¹ See p. 18 for states composing the several geographic divisions.² Bureau of the Census estimates.

It appears from this table that, notwithstanding they have by far the smallest number of stations, the states comprising the Western division not only had much the largest number of customers per 1,000 population at all periods, 128, 91, and 60, respectively, but also at the same time generated about 80 per cent more current per capita than did any other division. This division is followed in density of service by the North Central, in which only 9.1 per cent of the total population are customers, and by the North Atlantic division, in which 7.4 per cent of the inhabitants are customers. In every item indicated in the table the divisions have followed the same order at the different periods. The South Atlantic division has always had the fewest number of customers per 1,000 population, followed by the South Central; but the latter division has consistently maintained the last place in the matter of horsepower of prime movers, kilowatt capacity of dynamos, and kilowatt hours generated.

Table 21 shows for the United States as a whole the rate of increase in the per capita importance of the electric light and power industry, according to the data given in Table 20, both for the decade and for the two five-year periods 1912-1917 and 1907-1912. Accordingly, it appears that the horsepower of prime movers, the kilowatt capacity of dynamos, and the number of customers per 1,000 population increased somewhat more rapidly during the earlier period. The number of kilowatt hours generated per capita, however, increased much more rapidly between 1912 and 1917 (102.7 per cent) than during the earlier period (80.6 per cent). This, of course, indicates not only a more complete utilization of generating capacity but also a relatively larger consumption of current per customer and per capita.

Table 21

	RELATION OF LEADING ITEMS TO POPULATION—PER CENT OF INCREASE PER 1,000: 1917, 1912, AND 1907.		
	1907-1917	1912-1917	1907-1912
Horsepower of prime movers.....	166.0	58.2	68.1
Kilowatt capacity of dynamos.....	180.6	61.1	74.2
Kilowatt hours generated.....	266.2	102.7	80.6
Number of customers.....	213.6	72.5	81.8

As at preceding census periods, an attempt has been made to show the more important statistics of municipal central electric stations, grouped according to the population of the municipalities in which they are located. As a rule, municipal plants usually serve only one locality, while commercial plants frequently extend their service to numerous adjoining municipalities, as previously suggested. Hence the number of inhabitants in the city or town where a municipal plant is located usually represents pretty closely the population of the district served. In the case of commercial plants, however, there is not necessarily any direct relation between these figures, and no attempt was made until 1917 to find out specifically the population of the territory presumably reached by central station service as opposed to the number of inhabitants in the place where such plants are located. Finally, the reader must be cautioned that in many cases municipal plants are operating in cities which are partially and often largely supplied by commercial stations. This is particularly true in the case of those publicly owned plants which do only a street-lighting business, and accordingly, in many of the larger cities the population bears no significant relation to the number of customers.

MUNICIPAL CENTRAL ELECTRIC STATIONS, BY POPULATION OF CITIES IN WHICH LOCATED AND BY GEOGRAPHIC DIVISIONS: 1917, 1912, AND 1907.

Table 22	DIVISION ¹ AND POPULATION GROUP.	Census year.	Number of stations.	Value of plant and equipment.	INCOME.			Total expenses.	Total primary horse-power.	KILOWATT CAPACITY OF DYNAMOS.			OUTPUT OF STATIONS (KILOWATT HOURS).		Number of customers.
					Total.	Electric service.	All other sources.			Total.	Direct current, constant voltage and amperage.	Alternating and poly-phase current.	Generated during year.	Purchased during year.	
	Total.....	1917	2,318	\$127,375,200	\$40,260,219	\$39,586,063	\$674,156	\$31,440,912	859,098	582,463	43,864	538,599	1,039,320,089	192,538,399	976,514
		1912	1,562	77,065,144	23,218,989	22,663,708	555,281	16,917,165	559,328	396,677	44,564	352,113	537,526,730	88,580,377	525,648
		1907	1,252	42,879,447	14,011,999	13,614,434	397,565	9,167,188	321,351	209,016	45,993	163,023	289,462,788	(²)	283,625
	Under 5,000.....	1917	1,940	40,751,708	15,583,678	15,284,128	299,550	12,629,547	278,952	189,200	26,864	162,336	199,669,058	62,226,542	441,049
		1912	1,327	31,349,806	11,026,579	10,678,780	347,799	8,412,993	257,384	172,705	25,803	146,902	186,294,677	20,987,309	312,038
		1907	1,081	21,476,667	7,631,842	7,337,260	294,582	5,298,119	194,172	130,174	27,355	102,819	146,906,359	(²)	(²)
	5,000 but under 25,000.....	1917	322	30,006,361	12,754,300	12,509,052	245,248	8,977,453	239,361	160,891	9,688	151,203	268,465,798	61,017,137	318,772
		1912	189	15,953,305	6,014,722	5,861,287	153,435	4,103,721	128,506	91,696	7,030	84,666	127,432,560	20,835,366	136,057
		1907	142	9,726,310	3,466,142	3,389,192	76,950	2,128,859	75,975	48,107	7,798	40,399	78,788,119	(²)	(²)
	25,000 but under 100,000.....	1917	39	11,136,870	4,219,920	4,167,358	52,562	3,446,730	108,319	78,132	2,222	75,910	138,068,637	13,432,824	103,938
		1912	31	8,304,604	2,822,984	2,792,212	30,772	2,032,825	91,327	62,341	2,371	59,970	65,838,060	14,910,458	47,435
		1907	17	4,823,033	1,414,810	1,408,521	6,289	778,358	25,763	14,812	3,407	11,405	29,815,562	(²)	(²)
	100,000 but under 500,000.....	1917	9	15,768,883	4,120,790	4,074,017	46,773	3,334,861	123,404	82,700	3,850	78,550	219,538,246	3,838,470	100,902
		1912	7	8,550,566	1,584,082	1,575,506	8,486	1,095,607	47,255	27,064	844	26,220	61,120,808	76,900	24,242
		1907	6	2,760,732	736,276	716,532	19,744	373,750	12,616	8,250	2,240	6,010	17,819,478	(²)	(²)
	500,000 and over.....	1917	8	29,711,378	3,581,531	3,551,508	30,023	3,052,321	109,062	71,549	1,240	70,300	213,578,350	52,023,426	11,853
		1912	8	12,897,863	1,770,622	1,755,833	14,789	1,272,019	34,856	42,871	8,516	34,355	96,840,624	31,770,344	5,876
		1907	6	4,092,735	762,929	762,929	.....	588,192	12,825	7,673	5,283	2,390	16,133,270	(²)	(²)
	NORTH ATLANTIC.....	1917	195	13,139,670	5,130,524	5,031,228	99,296	4,246,033	99,149	66,903	4,594	62,309	100,379,996	31,835,161	106,993
		1912	159	9,616,877	3,226,157	3,136,497	89,660	2,475,596	77,698	54,031	5,055	48,976	68,625,617	6,864,419	58,219
		1907	150	7,838,995	2,308,082	2,266,506	41,576	1,436,815	56,580	35,325	5,503	29,822	48,861,638	(²)	(²)
	Under 5,000.....	1917	124	4,991,364	1,324,517	1,302,526	21,991	1,074,596	26,613	17,277	742	16,535	20,999,605	7,011,295	34,438
		1912	107	3,425,265	1,060,570	1,021,488	39,082	779,273	25,661	16,831	963	15,868	18,676,158	2,551,469	26,970
		1907	107	3,088,388	872,150	845,774	26,376	567,090	24,240	16,103	1,676	14,427	17,742,732	(²)	(²)
	5,000 but under 25,000.....	1917	60	5,579,723	2,550,655	2,488,586	62,069	2,046,786	43,398	29,011	3,612	25,399	45,124,252	13,229,595	55,413
		1912	43	3,835,433	1,426,777	1,379,337	47,440	1,070,210	32,084	22,508	2,240	20,268	26,971,971	4,312,950	25,406
		1907	38	3,025,195	897,546	882,346	15,200	571,386	21,049	12,892	2,197	10,695	19,182,675	(²)	(²)
	25,000 and over ⁴	1917	11	3,468,583	1,255,352	1,240,116	15,236	1,124,651	29,138	20,615	240	20,375	34,256,139	11,594,271	17,142
		1912	9	2,356,179	738,810	735,672	3,138	626,023	19,953	14,692	1,852	12,840	22,977,488	(²)	5,843
		1907	5	1,725,412	538,386	538,386	.....	268,339	11,291	6,330	1,630	4,700	11,936,231	(²)	(²)
	SOUTH ATLANTIC.....	1917	330	11,726,970	4,774,884	4,736,670	38,214	3,214,029	88,793	62,398	1,864	60,534	76,096,946	34,450,379	105,038
		1912	204	7,134,097	2,851,844	2,827,057	24,884	2,045,927	66,845	45,063	1,717	43,346	49,325,343	12,761,394	57,641
		1907	158	4,076,042	1,621,309	1,574,043	47,266	1,051,602	36,542	22,759	3,620	19,139	30,300,397	(²)	(²)
	Under 5,000.....	1917	273	5,425,324	2,117,465	2,098,357	19,108	1,595,746	33,869	23,356	1,199	22,166	22,821,335	17,176,622	49,594
		1912	168	3,626,102	1,351,844	1,341,649	10,195	1,008,405	29,945	19,934	994	18,940	19,220,900	7,728,273	33,767
		1907	142	2,973,002	1,072,023	1,027,220	44,803	726,425	25,119	17,349	1,775	15,574	18,283,131	(²)	(²)
	5,000 but under 25,000.....	1917	53	3,456,777	1,727,015	1,707,909	19,106	1,022,569	28,374	19,945	307	19,638	24,745,909	17,272,101	40,912
		1912	33	1,512,941	847,744	833,055	14,689	496,823	18,600	12,359	403	11,956	13,197,804	5,033,121	17,093
		1907	13	476,510	230,343	227,880	2,463	137,415	4,950	3,183	568	2,615	4,563,870	(²)	(²)
	25,000 and over ⁵	1917	4	2,844,869	930,404	930,404	.....	595,714	26,550	19,097	367	18,730	28,529,702	1,656	14,532
		1912	3	1,995,054	652,353	652,353	.....	540,699	18,300	12,770	320	12,450	16,906,639	(²)	6,781
		1907	3	626,530	318,943	318,943	.....	187,762	6,473	2,227	1,277	950	7,453,396	(²)	(²)
	NORTH CENTRAL.....	1917	1,327	69,620,138	21,234,761	20,805,928	428,833	17,357,952	425,234	296,741	29,132	267,609	561,336,189	95,790,240	516,202
		1912	873	42,212,002	11,656,482	11,314,999	341,483	8,589,329	265,159	204,380	33,419	170,961	309,367,765	41,492,999	269,461
		1907	727	22,955,162	7,403,015	7,142,752	260,263	5,072,384	176,221	115,990	32,717	83,273	159,005,189	(²)	(²)
	Under 5,000.....	1917	1,154	22,769,698	9,153,018	8,923,228	229,790	7,578,615	156,686	107,803	21,849	85,954	118,023,479	26,436,960	272,469
		1912	762	16,625,643	6,099,894	5,872,939	226,955	4,695,449	141,037	96,263	20,584	75,679	107,842,471	4,172,647	183,716
		1907	636	11,306,559	4,178,706	3,992,505	186,201	2,999,451	110,320	73,973	20,864	53,109	81,262,275	(²)	(²)
	5,000 but under 25,000.....	1917	143	13,746,276	5,804,156	5,691,004	113,152	4,210,989	118,371	79,418	4,428	74,990	138,225,325	16,082,944	159,136
		1912	89	7,849,799	2,727,047	2,652,500	74,547	1,836,670	58,042	43,628	3,466	40,162	64,838,060	5,515,435	69,133
		1907	76	4,828,705	1,829,198	1,775,195	54,003	1,127,782	40,166	26,042	4,383	21,659	43,628,086	(²)	(²)
	25,000 but under 100,000.....	1917	20	5,770,583	2,123,467	2,093,637	29,830	1,706,543	59,761	43,080	1,165	41,915	80,407,425	1,702,670	61,103
		1912	15	2,445,701	736,946	715,438	21,508	503,821	19,545	13,505	890	12,615	20,359,104	34,573	10,636
		1907	6	665,888	200,438	200,123	315	136,986	3,875	2,735	1,380	1,355	5,521,786	(²)	(²)
	100,000 but under 500,000.....	1917	3	4,703,609	1,154,446	1,128,300	26,146	1,197,210	28,154	20,500	700	19,800	71,039,410	(²)	21,205
		1912	3	2,976,238	447,667	443,983	3,684	411,328	14,575	10,054	654	9,400	21,534,962	(²)	100
		1907	5	2,177,490	472,801	453,037	19,744	280,168	9,720	6,037	1,277	4,760	13,487,582	(²)	(²)
	500,000 and over.....	1917	7	22,630,062	2,999,674	2,969,759	29,915	2,664,595	62,262	45,940	990	44,950	153,640,550	51,567,666	2,289
		1912	7	12,314,621	1,644,928	1,630,139	14,789	1,142,061	31,960	40,930	7,825	33,105	94,793,168	31,770,344	5,876
		1907	4	3,976,520	721,872	721,872	.....	547,997	12,140	7,203	4,813	2,390	15,105,460	(²)	(²)

¹ See p. 18 for states composing the several geographic divisions.² Exclusive of interest on bonds, etc.³ Figures not available.⁴ Includes in 1917, 1 station of the "100,000 but under 500,000" group; in 1912, 1 station of the "500,000 and over" group; and in 1907, 1 station of the "100,000 but under 500,000" group and 1 station of the "500,000 and over" group, in order that the operations of individual stations may not be disclosed.⁵ Includes in 1917, 2 stations of the "100,000 but under 500,000" group; in 1912, 1 station of the "100,000 but under 500,000" group; and in 1907, 1 station of the "500,000 and over" group.

ELECTRICAL INDUSTRIES: 1917.

MUNICIPAL CENTRAL ELECTRIC STATIONS, BY POPULATION OF CITIES IN WHICH LOCATED AND BY GEOGRAPHIC DIVISIONS: 1917, 1912, AND 1907—Continued.

DIVISION ¹ AND POPULATION GROUP.	Census year.	Number of stations.	Value of plant and equipment.	INCOME.			Total expenses.	Total primary horsepower.	KILOWATT CAPACITY OF DYNAMOS.			OUTPUT OF STATIONS (KILOWATT HOURS).		Number of customers.
				Total.	Electric service.	All other sources.			Total.	Direct current, constant voltage and amperage.	Alternating and poly-phase current.	Generated during year.	Purchased during year.	
SOUTH CENTRAL.....	1917	345	\$11,908,817	\$4,334,193	\$4,302,201	\$31,992	\$3,187,695	88,649	60,332	4,782	55,550	77,388,030	5,988,978	100,786
	1912	250	8,256,749	2,870,011	2,831,077	38,934	2,080,541	67,576	44,645	4,146	40,499	54,562,006	1,773,653	60,786
	1907	166	4,259,121	1,640,608	1,609,032	31,576	1,070,066	36,440	25,133	3,840	21,293	34,365,978	(²)	(²)
Under 5,000.....	1917	289	5,983,580	2,071,421	2,061,116	10,305	1,690,905	44,781	30,100	2,801	27,209	26,093,065	1,656,466	56,794
	1912	223	5,364,162	1,740,004	1,706,105	33,899	1,392,422	44,271	29,784	3,035	26,749	23,687,220	654,403	44,961
	1907	152	3,046,244	1,133,925	1,104,549	29,376	788,196	27,510	18,415	2,772	15,643	23,272,368	(²)	(²)
5,000 but under 25,000.....	1917	50	4,462,390	1,775,543	1,753,856	21,687	1,096,281	36,118	24,382	1,291	23,091	40,952,255	1,547,684	37,772
	1912	21	1,513,443	606,183	601,158	5,025	437,830	14,010	9,536	921	8,615	15,595,262	2,500	12,243
	1907	10	705,552	321,549	319,349	2,200	182,060	5,625	3,815	515	3,300	6,861,650	(²)	(²)
25,000 and over ³	1917	6	1,462,847	487,229	487,229	.....	400,509	7,750	5,850	600	5,250	10,342,710	2,784,878	6,200
	1912	6	1,378,144	523,814	523,814	.....	250,239	9,295	5,325	190	5,135	10,479,624	1,116,760	3,581
	1907	4	507,325	185,134	185,134	.....	99,813	3,305	2,903	553	2,350	4,231,960	(²)	(²)
WESTERN.....	1917	121	20,979,605	4,785,857	4,710,036	75,821	3,435,208	157,273	96,069	3,492	92,597	224,118,928	24,473,641	147,515
	1912	76	9,845,419	2,614,398	2,554,078	60,320	1,725,862	82,050	48,558	227	48,331	55,645,999	25,657,912	79,542
	1907	51	3,750,127	1,038,985	1,022,101	16,884	566,318	15,568	9,809	313	9,496	16,929,536	(²)	(²)
Under 5,000.....	1917	100	2,481,832	917,257	898,901	18,356	689,685	17,003	10,664	192	10,472	11,731,574	9,945,199	27,754
	1912	67	2,308,634	774,267	736,599	37,668	537,444	16,470	9,893	227	9,666	11,867,929	5,880,517	22,624
	1907	44	1,062,474	375,038	367,212	7,826	216,957	6,983	4,334	268	4,066	6,345,853	(²)	(²)
5,000 and over ⁴	1917	21	18,497,773	3,868,000	3,811,135	57,465	2,745,518	140,270	85,425	3,300	82,125	212,387,354	14,528,442	119,761
	1912	9	7,536,785	1,840,131	1,817,479	22,652	1,188,418	65,580	38,665	.....	38,665	43,778,070	19,807,395	56,918
	1907	7	2,687,653	663,947	654,889	9,058	349,361	8,585	5,475	45	5,430	10,583,733	(²)	(²)

¹ See p. 18 for states composing the several geographic divisions.² Figures not available.³ Includes in 1917, 1 station of the "100,000 but under 500,000" group; and in 1912, 2 stations of the "100,000 but under 500,000" group.⁴ Includes in 1917, 1 station of the "25,000 but under 100,000" group, 2 stations of the "100,000 but under 500,000" group, and 1 station of the "500,000 and over" group; in 1912, 2 stations of the "25,000 but under 100,000" group and 1 station of the "100,000 but under 500,000" group; and in 1907, 2 stations of the "25,000 but under 100,000" group.

In Table 22 municipal stations are grouped according to the population of cities in which located, for the years 1917, 1912, and 1907. For each group, also, is shown not only the "value of plant and equipment," but also the "total income," "total expenses," "total primary horsepower," "total kilowatt capacity of dynamos," "output of stations," and "number of customers." From this table it is evident that there has been no marked change in the number of stations located in places having a population of 25,000 and over. The most rapid increase from 1912 to 1917 has been in the population group between 5,000 and 25,000, or about 70 per cent. The group of stations in places having less than 5,000 population is by far the most numerous (1,940 out of a total of 2,318), but the rate of increase in this group has been only 46.2 per cent during the last five years. In the "value of plant and equipment" the rate of increase has been most rapid in the "500,000 and over" group, due primarily to the installation of the large Los Angeles plant and to the extension of already existing plants in Chicago. This group, both in absolute amount and in percentage of increase, has

been followed by those plants in places having 5,000 but under 25,000 population. The former group, while leading in the rate of increase in "value of plant and equipment," has been surpassed in most other respects by the small group found in places having from 100,000 to 500,000 population. This more rapid growth is almost solely accounted for by the large municipal station installed in the city of Cleveland and serving a portion of its population.

Table 23 shows for the plants grouped in Table 22 the relative importance of the different items for the year 1917.

Table 23	MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT DISTRIBUTION ACCORDING TO POPULATION OF MUNICIPALITIES IN WHICH LOCATED: 1917.				
	Under 5,000.	5,000 but under 25,000.	25,000 but under 100,000.	100,000 but under 500,000.	500,000 and over.
Number of stations.....	88.7	13.9	1.7	0.4	0.3
Value of plant and equipment.....	32.0	28.6	8.7	12.4	28.3
Total income.....	38.7	31.7	10.5	10.2	8.9
Total expenses.....	40.2	28.5	11.0	10.6	9.7
Horsepower of prime movers.....	32.5	27.8	12.6	14.4	12.7
Kilowatt capacity of dynamos.....	32.5	27.6	13.4	14.2	12.3
Kilowatt hours generated.....	19.2	25.8	13.3	21.1	20.6
Kilowatt hours purchased.....	32.3	31.7	7.0	2.0	27.0
Number of customers.....	45.2	32.7	10.6	10.3	1.2

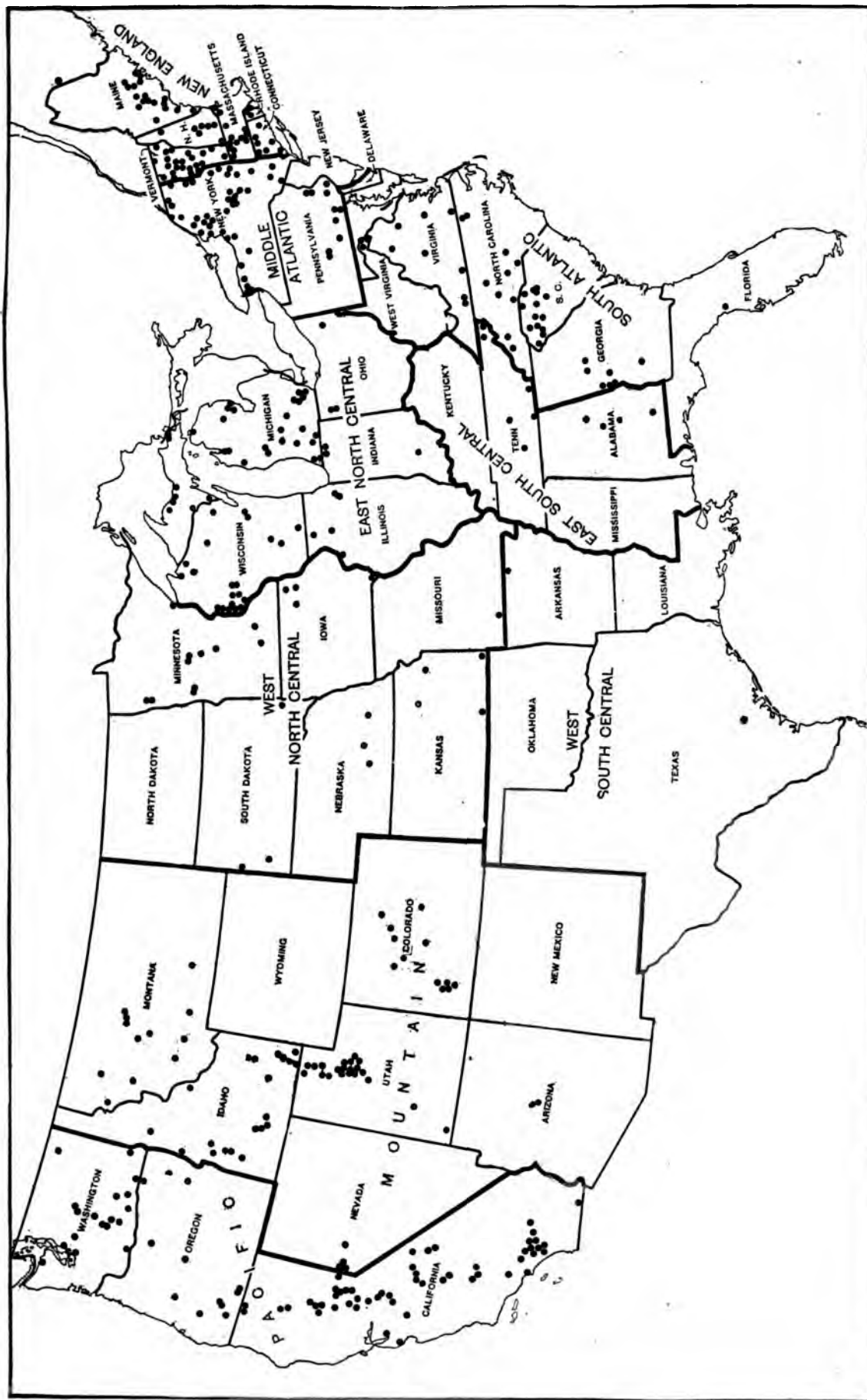
From this table it appears that 83.7 per cent of all municipal plants are in places having less than 5,000 population, and in all other respects, except in the number of kilowatt hours generated, this group shows the highest proportions—32 per cent of the value of plant and equipment, 38.7 per cent of the total income, 40.2 per cent of the total expenses, 32.5 per cent of the horsepower of prime movers, 32.5 per cent of the kilowatt capacity of dynamos, 32.3 per cent of the kilowatt hours purchased, and 45.2 per cent of the number of customers. Upon comparison with 1912, however, it appears that there has been a considerable decrease in the importance of this group as compared with the higher population groups. In that year stations in places having less than 5,000 population comprised 85 per cent of the total number reporting, 40.7 per cent of the value of plant and equipment, 47.5 per cent of the total income, 46 per cent of the primary power, and 43.5 per cent of the kilowatt capacity of dynamos, and generated 34.7 per cent of all current, as opposed to only 19.2 per cent in 1917. The value of plant and equipment is practically the same in the "5,000 but under 25,000" group and in the "500,000 and over" group. In all other respects, however, the former group is markedly in the lead. The comparative importance of the various items is not much different in the "25,000 but under 100,000" group and the "100,000 but under 500,000" group, except in the number of stations and in the number of kilowatt hours purchased, in which the former has a marked advantage, while the latter shows a greater value of plant and equipment (12.4 per cent of the total as opposed to 9 per cent) and generated a far larger proportion of current (21.1 per cent of the total as opposed to 13.7 per cent). Relative to the amount of investment, the number of customers is decidedly lower in the larger population groups, due to the fact that these plants, in the main, do only a street-lighting business.

All stations grouped according to the population of districts served: 1917.—It was thought desirable for the present census to secure, if possible, more complete data than have ever yet been assembled regarding the population of the territory actually served by all central electric stations in the United States, as contrasted with the population of municipalities in which central stations are located. To be sure, absolutely accurate figures on this subject are in some instances practically impossible to obtain, because of the nature of the serv-

ice rendered and the character of territory served. It frequently happens, also, that an electric light and power plant will serve a population which in the summer is far in excess of the normal winter population. In such cases it is naturally difficult to determine what is the true population served, and the Census Bureau, in the absence of more specific information, has usually accepted the average of the summer and winter population as being a reasonable estimate of the number of inhabitants in the district served with electricity by a given station. Attention should further be called to the fact that frequently a number of commercial stations are serving the same population group, while it also happens in many cases that municipal and commercial plants do business in the same territory. Hence, in combining the number of inhabitants served by the two groups of plants, great care had to be exercised in order to eliminate duplicated population. Finally, while every effort has been made, by means of correspondence and by the use of the most recent figures on population, to check up all the schedule returns in answer to this inquiry, there yet remains a slight possibility of error, due to the fact that the actual population of many municipalities can not always be accurately ascertained. Some, particularly in the industrial sections, have during the past few years grown with unwonted rapidity, while it is probable that others have actually lost a portion of their population since the last official census was taken in 1910. It is felt, however, that any of the errors which may have crept into these figures will largely counterbalance each other, so that the public may be assured that the percentage of error in the following tables has been reduced almost to the vanishing point.

In Table 24 an attempt has been made to show the amount of current sold for light and power by all central electric stations in the United States, grouped into 10 classes according to the population of the districts actually served from a given center. It should be remembered that the population reported is not necessarily included within the bounds of any one municipality. In a few instances it comprises only that portion of such population which a central station is in a position to serve, but in very numerous cases the number of people who live within the territory reached by the service lines of an electric station comprise the aggregate population of many separate municipalities, together with an uncertain number of suburban residents.

MAP 2.—LOCATION OF HYDROELECTRIC CENTRAL STATIONS REPORTING WATER POWER OF 1,000 HORSEPOWER OR MORE, BY GEOGRAPHIC DIVISIONS: 1917.



CHAPTER III.—DEVELOPMENT OF HYDROELECTRIC STATIONS.

Hydroelectric development.—As the cost of fuel mounts, increasing attention is being directed to the possibility of a further extension of hydroelectric development in the United States.

In the movement for fuel conservation, through the increased utilization of water power and the use of electricity thus generated for industrial purposes in place of the present wasteful methods of supplying motive power, the states and the Federal Government have taken a profound interest. Estimates vary widely as to the actual amount of water power which would at all times be available for the generation of electricity, and at present there are many sections of the country which could not in any event be supplied with current produced in water-power plants, owing to the natural limits to long-distance transmission. The official estimates made in 1912 place the minimum horsepower of our waterways at 27,000,000 during the most unfavorable periods, the maximum being at least 52,000,000.¹ Some estimates have placed the maximum at not less than 60,000,000, and, beyond a doubt, many times the minimum horsepower here mentioned could be secured through artificial development, such as the construction of storage basins, etc. According to the census figures for 1914, 1,826,443 water horsepower was used in manufacturing industries;² and the present census of electrical industries discloses the fact that in addition central electric stations and street railways together utilize 4,905,256 water horsepower. This would indicate a total developed water horsepower at the present time of not far from 7,000,000, since there are numerous private developments which have not been included in the census returns. Hence there is apparently left, under the most unfavorable conditions, at least 20,000,000 undeveloped water horsepower, an amount which could be vastly increased by artificial measures. In 1917 the electrical industries under consideration reported 11,992,991 steam horsepower and 238,700 horsepower in internal-combustion engines, while the latest figures available show 15,681,688 steam horsepower used in manufacturing industries, together with 991,905 in internal-combustion engines. Accordingly, the total horsepower, other than water wheels and turbines used in all industries and electric public utilities, is probably at present not far from 30,000,000. Steam heating plants will, in addition, utilize many million more boiler horsepower, and the 60,000 odd locomotive engines in the United States³ doubtless represent in the aggregate a steam horsepower even greater than that used in industries and local public utilities.

¹ Report of the Commissioner of Corporations on Water-power Development in the United States, 1912.

² Statistical Abstract of the Census of Manufactures, 1914, p. 491.

³ Statistical Abstract, 1916, p. 294.

It is no doubt true that a large part of the motive power which is at present supplied by the wasteful combustion of coal and the utilization of gas and oil can be, and eventually will be, obtained through the generation of electric current by means of nature's unfailing water supply. Buildings may thus be heated by electricity, and a large per cent of our steam railways might profitably be electrified. As our resources of coal and oil become exhausted, with the attendant prohibitive rise in prices, hydroelectric development will increase with rapid strides. It must not be forgotten, however, that the distance over which electricity can profitably be transmitted, which is now not less than 250 miles, is still strictly limited by engineering difficulties. Hence there will always be sections which can not be served by hydroelectric development. Further, the capital outlays required for the development of storage facilities as well as for the installation of generating stations sufficiently large for economic operations, not to mention the enormous cost of constructing and maintaining high-tension transmission lines, act in the present as a strong deterrent from the rapid growth of hydroelectric generation and transmission of current. Again, if our water power were developed to its highest utilization it would naturally be accompanied by the abandonment of a large number of the central stations now in operation, together with the junking of a large part of the equipment at present used in manufacturing establishments. To be sure, there would be a saving in fuel which at present prices would amount to from \$1,000,000,000 to \$2,000,000,000 annually. There would be a further saving of at least hundreds of millions of dollars which are now paid as wages to the many thousands of workers whose services are rendered necessary by the present methods of supplying power, but whose services would no longer be necessary with a general electrification of industries. All of these prospective savings appeal to the imagination of one who studies the future problems of industry. At present, however, the high cost of copper and of capital needed for the developmental purposes is rather effectively offsetting the high cost of fuel used in the old establishments.

In many cases it appears to be true that the gains which would result from a conservation of the national fuel supply and a full utilization of the national water resources would be "public and future" rather than "private and present." What from an engineering point of view may be possible is not necessarily advantageous. Hence, though there is sufficient water power in the New England states and in New York, Pennsylvania, West Virginia, and the Carolinas to supply most of the industries in the United States, and while there are still vast resources in the mountains of the West which would make it

possible to electrify an extensive mileage of the trans-continental railways, and though many buildings and private residences might be heated by means of electric current, yet the development under private control will be gradual, until the time is reached when the economic and social gains generally resulting from conservation of this sort will outweigh the costs which such a change would unavoidably entail. With lower interest rates, with lower prices for material and labor, together with greater certainty of return on legitimate investment than at present exists, the movement in this direction would doubtless be more rapid. At any rate it may reasonably be expected

that in the future, wherever possible without the actual destruction of existing investments, water power will be more widely used.

Importance of hydroelectric stations.—With a view to showing the relative importance of those larger water-power plants to which the term "hydroelectric" is more properly applied, Table 26 has been prepared. In this tabulation are given, for 1917 and 1912, the leading items for all stations in the United States, together with corresponding items for those stations which report water-power equipment of 1,000 horsepower and over. Some of these, of course, use other kinds of primary power.

Table 26

CENTRAL ELECTRIC STATIONS—COMPARISON OF HYDROELECTRIC AND ALL STATIONS: 1917 AND 1912.

	1917		1912		Hydroelectric stations—Per cent of total.		Per cent of increase. ¹	
	All stations.	Stations reporting water power of 1,000 horsepower and over.	All stations.	Stations reporting water power of 1,000 horsepower and over.	1917	1912	All stations.	Hydroelectric stations.
Number of stations.....	6,542	259	5,221	225	4.0	4.3	25.3	15.1
Value of plant and equipment.....	\$3,080,392,141	\$1,396,619,224	\$2,175,678,266	\$922,954,341	45.6	42.2	40.7	51.3
Total income.....	\$526,894,240	\$157,580,682	\$302,273,398	\$72,717,582	29.9	24.1	74.3	116.7
Electric service.....	\$502,069,980	\$149,224,378	\$287,138,657	\$66,852,631	29.7	23.3	74.8	123.2
All other sources.....	\$24,824,260	\$8,356,304	\$15,134,741	\$5,864,951	33.6	38.8	64.1	42.5
Total expenses, including salaries and wages.....	\$426,568,307	\$125,027,197	\$234,577,277	\$58,342,064	29.3	24.0	81.8	121.9
Total number of persons employed.....	105,541	25,590	79,335	17,160	24.2	21.6	33.0	49.1
Prime movers:								
Number.....	13,795	2,694	11,902	2,094	19.5	17.6	15.9	28.7
Horsepower.....	12,936,755	5,867,447	7,530,044	3,176,974	45.4	42.2	71.8	84.7
Steam engines—								
Number.....	5,788	323	6,813	327	5.6	4.8	-15.0	-1.2
Horsepower.....	1,701,677	196,996	1,896,382	204,673	11.6	10.8	-10.2	-3.8
Steam turbines—								
Number.....	1,699	331	1,034	190	19.5	18.4	64.3	74.9
Horsepower.....	6,747,399	1,567,207	3,054,396	680,069	23.2	22.3	120.9	130.4
Water wheels and turbines—								
Number.....	3,374	1,995	2,939	1,558	59.1	53.0	14.8	28.0
Horsepower.....	4,277,273	4,092,892	2,469,231	2,286,546	95.7	92.6	73.2	79.0
Internal-combustion engines—								
Number.....	2,934	45	1,116	19	1.5	1.7	162.9	136.8
Horsepower.....	210,406	10,362	111,035	5,686	4.9	5.1	89.5	82.2
Dynamos:								
Number.....	13,428	2,427	12,610	1,932	18.1	15.3	6.5	25.6
Kilowatt capacity.....	8,994,407	3,954,294	5,165,439	1,979,397	44.0	38.3	74.1	99.8
Number of kilowatt hours generated.....	25,438,303,272	13,924,464,619	11,569,109,885	5,845,504,860	54.7	50.5	119.9	138.2
Stationary motors served:								
Number.....	585,924	145,032	435,473	73,645	26.1	16.9	27.6	96.9
Horsepower.....	9,216,330	3,360,371	4,130,619	1,283,769	36.5	31.1	123.1	161.8
Number of customers.....	7,178,703	1,686,284	3,837,518	(²)	23.5	(²)	87.1	(²)

¹ A minus sign (—) denotes decrease.² Figures not available.

It is interesting to find that the actual increase in number of hydroelectric plants since 1912 has been only 34, or 15.1 per cent, while the number of all stations has increased 25.3 per cent. In every other important respect, however, the rate of increase has been much more rapid for the water-power plants. The value of plant and equipment increased 51.3 per cent as opposed to an increase of only 40.7 per cent for all stations, until at present nearly half the total investment in central stations, 45.6 per cent, is found in the 259 hydroelectric plants. The rate of increase in other items appears fully to have warranted this more rapid growth in investment. For instance, the horsepower of prime movers increased 84.7 per cent and the total dynamo capacity 99.8 per cent, while the corresponding growth for all stations was only 71.8 per cent and 74.1 per cent, respectively. Further, the income from the sale of current has increased 123.2 per cent, from \$66,852,631 in 1912 to \$149,224,378 in 1917, an absolute percentage gain of 48.4 per cent over the rate of increase shown by all stations, which was 74.8 per cent. The increase in expenses was almost

equally rapid, 121.9 per cent, though relatively not so great as in the case of central stations in general. At the present time, accordingly, these hydroelectric plants report 29.9 per cent of the total income and 29.3 per cent of the total expenses, while in 1912 these proportions were 24.1 and 24, respectively. The growth in number of kilowatt hours generated, while more rapid for hydroelectric stations (138.2 per cent) than for all stations (119.9 per cent), has not been relatively so great as the increase in income from the sale of current. In other words, it would appear that the rates charged for service may have decreased somewhat more rapidly for all stations than for hydroelectric stations, since the income from electric service for the former increased only 74.8 per cent, while the number of kilowatt hours generated increased 119.9 per cent, an absolute percentage difference of 45.1 per cent as opposed to an absolute percentage difference in the case of hydroelectric plants of only 15 per cent. Both groups apparently have been utilizing a given amount of generating equipment much more effectively than at earlier periods, while the fact that the

dynamo capacity of hydroelectric stations has increased much more rapidly than the horsepower capacity (99.8 as opposed to 84.7 per cent) indicates that in 1912 these stations probably had a good deal of excess water-power development.

Table 27

	ALL GENERATING STATIONS AND HYDROELECTRIC STATIONS COMPARED: 1917.		
	All generating stations—Number or amount.	Stations reporting water power of 1,000 horsepower and over.	Per cent of total.
Number of plants.....	5,124	259	5.1
Number of separate generating stations.....	5,824	684	11.7
Number of cities, towns, etc., served by generating plants.....	11,364	2,497	22.0
Value of plant and equipment.....	\$2,952,423,577	\$1,396,619,224	47.3
Total income.....	\$494,972,405	\$157,580,682	31.8
Light, heat, and power, including free service.....	\$471,063,414	\$149,224,378	31.8
All other sources.....	\$23,908,991	\$8,356,304	35.0
Total expenses, including salaries and wages.....	\$400,445,429	\$125,027,197	31.2
Total number of persons employed.....	99,666	25,590	25.7
Total horsepower.....	12,875,522	5,867,447	45.6
Steam engines and steam turbines—			
Number.....	7,300	654	9.0
Horsepower.....	8,391,816	1,764,203	21.0
Water wheels and turbines—			
Number.....	3,358	1,995	59.4
Horsepower.....	4,274,479	4,092,882	95.8
Internal-combustion engines—			
Number.....	2,914	45	1.5
Horsepower.....	209,227	10,362	5.0
Kilowatt capacity of dynamos.....	8,943,423	3,954,294	44.2
Output of stations.....	29,807,378,386	16,018,906,900	53.7
Kilowatt hours generated.....	25,438,303,272	13,924,464,619	54.7
Kilowatt hours purchased.....	4,369,075,114	2,094,442,371	47.9
Kilowatt hours sold.....	24,661,331,266	13,148,946,560	53.3
For light.....	4,772,277,255	1,120,506,702	23.5
For power.....	12,622,123,027	7,523,445,685	59.6
To other companies.....	7,266,930,984	4,504,994,173	62.0
Stationary motors served:			
Number.....	509,778	145,032	28.5
Horsepower.....	8,765,570	3,360,371	38.3
Number of customers.....	6,570,430	1,686,284	25.7

Comparison of hydroelectric and all generating stations.—It is perhaps more accurate as well as more satisfactory to compare hydroelectric plants with all stations which generate current instead of with all stations in the United States, since a large percentage purchase their current, and accordingly furnish a poor basis of comparison. In Table 27 some of the more detailed relations are worked out in order to show the relative development of water-power plants. All primary power and dynamo equipment not in use has been eliminated from the figures here given. It is significant to find that, while these stations comprise only 5.1 per cent of the total number of central generating plants, they report 11.7 per cent of the separate generating stations, each hydroelectric plant frequently having several different generating stations which supply current to a central point for distribution. Further, as a result of their transmission of current over long distances they serve 22 per cent of all municipalities supplied by generating stations. They represent almost half the investment in plant and equipment (47.3 per cent), receive nearly one-third of the total income (31.8 per cent), incur about one-third of the total expenses (31.2 per cent), and employ a little more than one-fourth of all employees in generating stations (25.7 per cent). The water horsepower which they report is 95.8 per cent of the total, whereas in 1912 the proportion was 92.6 per cent. The character of business done by these water-power

plants is indicated by the fact that while they sell 53.3 per cent of all current sold, their proportion of current sold for lighting is only 23.5 per cent, while the proportion sold for power and to other companies is 59.6 per cent and 62 per cent, respectively. The relative number of customers (25.7 per cent) corresponds closely with the relative amount of current delivered for lighting purposes. That the rates of hydroelectric stations are in general much lower than those charged by other generating stations is shown by the fact that while they sell 53.3 per cent of all current, their income from the sale of current is only 31.8 per cent of the total.

Table 28

	ALL GENERATING STATIONS AND HYDROELECTRIC STATIONS—AVERAGE PER STATION: 1917.	
	All generating stations.	Stations reporting water power of 1,000 horsepower and over.
Number of separate generating stations.....	1	3
Number of cities, towns, etc., served by generating stations.....	2	10
Value of plant and equipment.....	\$576,195	\$5,392,352
Total income.....	\$96,599	\$608,420
Total expenses, including salaries and wages.....	\$78,151	\$482,730
Total number of persons employed.....	19	99
Total horsepower.....	2,513	22,654
Kilowatt capacity of dynamos.....	1,745	15,267
Output of stations.....	5,817,309	61,849,062
Kilowatt hours generated.....	4,964,540	53,762,412
Kilowatt hours purchased.....	852,669	8,086,650
Kilowatt hours sold.....	4,812,906	50,784,133
For light.....	931,358	4,326,281
For power.....	2,463,334	29,048,063
To other companies.....	1,418,214	17,398,800
Horsepower of stationary motors served.....	1,711	12,974
Number of customers.....	1,282	6,511

The data given in Table 28, showing the averages per station, will perhaps make clear the great importance and size of hydroelectric plants. They have 2.6 separate generating stations per establishment as opposed to only 1.1 for all generating stations, and they serve 9.6 municipalities per station, while for all generating stations the average is only 2.2. The average value of plant and equipment, \$5,392,352, is more than nine times as great as that of all stations in this group, \$576,195. It is apparent, however, that the average income, \$608,420, is smaller relative to the investment than is the case in all generating stations, in which the average is \$96,599. The greater amount of investment per plant has a close relation to the greater capacity and output of stations, the average number of kilowatt hours generated being nearly eleven times as great as for all generating stations. Finally, the economies which result from the decreased amount of labor needed in connection with water-power generation is evidenced by the fact that, while all generating stations report an average of 19.4 of persons employed, the hydroelectric stations, in spite of their far greater output and capacity, employ but five times as many men, or 98.8 per plant. The average investment per kilowatt capacity of dynamos is found to be \$353 for hydroelectric stations as compared with \$330 for all generating stations in the United States and \$312 for all generating stations other than hydroelectric stations.

ELECTRICAL INDUSTRIES: 1917.

HYDROELECTRIC STATIONS REPORTING WATER POWER OF 1,000

Table 29		Number of plants.	Number of separate stations.	Value of plant and equipment.	INCOME.					
DIVISION AND STATE.	Aggregate.				Electric service.				All other income.	
					Total.	Light, heat, and power.	Sale of electric current to other public service corporations.	Estimated value of free service.		
1	UNITED STATES.....	259	684	\$1,396,619,224	\$157,580,682	\$149,224,378	\$121,382,108	\$27,653,444	\$188,826	\$4,356,304
2	GEOGRAPHIC DIVISIONS:									
3	New England.....	49	106	103,442,805	18,073,660	17,168,329	12,892,489	4,245,711	30,129	905,331
4	Middle Atlantic.....	42	70	162,678,818	22,499,600	20,689,888	14,598,605	6,073,123	18,160	1,809,712
5	East North Central.....	40	130	206,522,074	31,648,445	30,913,601	26,848,662	4,028,979	35,960	734,844
6	West North Central.....	26	67	127,655,106	12,082,451	11,601,759	8,989,681	2,611,557	521	460,692
7	South Atlantic.....	32	57	97,490,854	9,954,988	9,527,395	8,012,016	1,509,949	5,430	427,593
8	South Central.....	10	34	83,375,366	5,168,109	5,018,766	3,259,988	1,758,698	80	149,343
9	Mountain.....	25	98	213,566,487	19,176,107	16,706,120	15,033,031	1,604,532	68,557	2,469,987
	Pacific.....	35	122	401,887,714	38,997,322	37,598,520	31,747,636	5,820,896	29,989	1,398,802
10	NEW ENGLAND:									
11	Maine.....	11	31	22,348,527	2,240,206	2,018,850	1,506,722	483,616	28,512	221,356
12	New Hampshire.....	6	12	11,587,477	1,643,718	1,514,030	911,620	602,410	.....	129,688
13	Vermont.....	14	27	11,593,014	1,300,585	1,260,160	1,036,136	222,474	1,550	40,425
14	Massachusetts.....	10	20	32,235,878	5,740,706	5,533,622	3,946,517	1,587,105	.....	207,083
	Rhode Island and Connecticut...	8	16	25,672,909	7,148,446	6,841,667	5,401,494	1,350,106	67	306,779
15	MIDDLE ATLANTIC:									
16	New York.....	32	56	123,591,874	17,916,496	16,337,818	11,899,550	4,423,673	14,565	1,578,678
	Pennsylvania.....	10	14	39,086,944	4,583,104	4,352,070	2,699,065	1,649,450	3,565	231,034
17	EAST NORTH CENTRAL:									
18	Ohio and Indiana.....	5	11	17,072,565	2,099,201	2,055,314	1,587,247	464,982	3,085	43,887
19	Illinois.....	4	28	45,774,148	7,016,185	6,810,032	6,156,854	626,040	27,133	206,153
20	Michigan.....	17	59	112,281,768	19,633,305	19,223,484	17,306,948	1,910,999	5,537	409,821
	Wisconsin.....	14	32	31,393,593	2,899,754	2,824,771	1,797,613	1,026,958	200	74,983
21	WEST NORTH CENTRAL:									
22	Minnesota.....	11	32	45,663,552	6,019,024	5,901,168	5,457,906	443,176	86	117,856
23	Iowa and Missouri.....	5	11	51,875,734	2,739,556	2,601,363	873,505	1,727,423	435	138,193
24	South Dakota.....	3	4	8,148,755	626,595	513,430	496,721	16,709	.....	113,165
25	Nebraska.....	3	8	2,553,532	225,796	217,592	163,033	54,559	.....	8,204
	Kansas.....	4	12	19,413,533	2,451,480	2,368,206	1,998,516	369,600	.....	83,274
26	SOUTH ATLANTIC:									
27	Virginia and West Virginia.....	9	19	22,695,884	1,586,449	1,548,885	1,400,771	52,864	5,250	37,664
28	North Carolina.....	10	14	30,667,521	4,745,294	4,612,382	3,905,388	706,814	180	132,912
29	South Carolina.....	8	16	26,788,794	2,255,597	2,040,962	1,673,971	366,991	.....	214,635
	Georgia and Florida.....	5	8	17,158,655	1,367,648	1,325,166	941,886	383,280	.....	42,482
30	SOUTH CENTRAL:									
31	Tennessee.....	5	11	49,246,609	2,717,534	2,684,449	1,485,236	1,199,213	.....	33,085
	Alabama, Arkansas, and Texas..	5	23	34,128,757	2,450,575	2,334,317	1,774,752	559,485	80	116,258
32	MOUNTAIN:									
33	Montana.....	5	17	83,214,313	9,016,247	7,305,387	6,531,841	773,546	.....	1,710,860
34	Idaho.....	6	15	24,770,195	1,691,890	1,577,964	1,458,064	103,470	16,300	114,026
35	Colorado.....	5	22	29,941,692	2,357,668	2,275,185	2,011,796	263,140	250	82,483
36	Arizona and Nevada.....	4	8	19,589,203	1,122,097	1,026,418	955,383	70,035	.....	96,679
	Utah.....	5	36	56,051,084	4,988,205	4,522,266	4,075,918	394,341	52,007	465,639
37	PACIFIC:									
38	Washington.....	10	23	33,505,118	3,355,752	3,293,114	3,163,629	121,830	7,655	62,638
39	Oregon.....	7	12	15,333,674	1,060,488	1,021,446	992,299	27,197	1,960	39,042
	California.....	18	87	353,048,922	34,581,082	33,283,960	27,591,708	5,671,868	20,384	1,297,122

DEVELOPMENT OF HYDROELECTRIC STATIONS.

45

HORSEPOWER OR MORE, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

Total expenses, including salaries and wages.	Total number of persons employed.	PRIMARY POWER.												
		Aggregate.		Steam engines.										
				Total.		500 horsepower or under.		Over 500 and under 2,000 horsepower.		2,000 and under 5,000 horsepower.		5,000 horsepower and over.		
		Number.	Horsepower.	Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.	
\$125,027,197	25,590	2,694	5,867,447	323	196,996	233	57,279	71	65,512	14	37,298	5	36,907	1
14,102,827	3,186	494	559,452	44	21,774	27	8,491	17	13,280					2
17,513,593	3,221	419	1,013,847	54	40,708	39	9,478	11	9,430	2	5,000	2	16,800	3
25,372,385	5,837	594	911,636	81	45,407	53	13,886	26	27,361	2	4,160			4
10,906,843	2,208	220	458,355	39	12,317	36	8,187	2	1,450	1	2,680			5
8,061,035	1,372	216	606,328	9	5,500	5	1,250	3	2,250	1	2,000			6
4,902,960	928	115	318,214	35	7,960	33	6,570	2	1,390					7
12,526,371	2,563	287	658,829	31	20,334	25	5,340	6	6,951	3	8,043			8
31,651,183	6,275	349	1,280,786	27	42,996	15	4,074	4	3,400	5	15,415	3	20,107	9
1,647,106	434	154	81,192	13	5,800	10	3,500	3	2,300					10
1,048,578	267	60	62,264	7	4,389	3	1,189	4	3,200					11
996,870	253	83	59,608	6	2,435	5	1,685	1	750					12
4,496,544	928	106	209,085	5	2,425	3	875	2	1,550					13
5,917,729	1,304	91	147,303	13	6,725	6	1,245	7	5,480					14
13,673,205	2,416	338	822,224	43	35,508	29	6,278	11	9,430	1	3,000	2	16,800	15
3,840,388	805	81	221,623	11	5,200	10	3,200			1	2,000			16
1,823,469	335	98	83,671	5	3,920	2	520	3	3,400					17
5,720,813	1,529	134	169,060	34	17,090	26	7,530	8	9,560					18
15,460,973	3,492	235	504,719	28	17,407	15	3,746	11	9,501	2	4,160			19
2,367,125	481	127	184,186	14	6,990	10	2,090	4	4,900					20
5,351,491	1,158	89	149,117	18	4,467	17	3,717	1	750					21
2,478,676	337	51	179,760	12	3,100	11	2,400	1	700					22
535,966	88	13	14,500											23
193,405	39	18	9,050	4	800	4	800							24
2,344,315	586	49	105,928	5	3,960	4	1,270			1	2,680			25
1,515,234	341	54	74,540	3	1,900	1	400	2	1,500					26
2,873,014	467	49	203,700	1	250	1	250							27
2,521,252	315	69	239,650	2	500	2	500							28
1,141,535	249	44	88,438	3	2,850	1	100	1	750	1	2,000			29
2,522,762	355	42	150,074	7	1,490	7	1,490							30
2,380,198	573	73	168,140	28	6,470	26	5,080	2	1,390					31
4,909,974	576	72	268,157	6	835	6	835							32
1,348,880	311	49	49,615	1	250	1	250							33
1,820,039	426	64	86,689	20	7,455	16	3,855	4	3,600					34
793,574	197	19	35,415											35
3,653,904	1,053	83	218,923	7	11,794	2	400	2	3,351	3	8,043			36
2,625,962	825	45	130,249	2	255	2	255							37
955,324	262	42	36,181	8	3,550	6	1,850	2	1,700					38
28,069,897	5,188	262	1,114,356	17	39,191	7	1,969	2	1,700	5	15,415	3	20,107	39

ELECTRICAL INDUSTRIES: 1917.

HYDROELECTRIC STATIONS REPORTING WATER POWER OF 1,000 HORSEPOWER

Table 29—Continued.		PRIMARY POWER—continued.																		
		Steam turbines.										Internal-combustion engines.		Water wheels and motors.						
		Total.		500 horse-power or under.		Over 500 and under 2,000 horse-power.		2,000 and under 5,000 horsepower.		5,000 horse-power and over.				Total.		500 horse-power or under.		Over 500 and under 2,000 horsepower.		
DIVISION AND STATE.		Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	
1	UNITED STATES.....		331	1,567,207	22	5,414	137	144,165	70	216,393	102	1,201,235	45	10,362	1,995	4,092,882	778	212,470	717	716,617
2	GEOGRAPHIC DIVISIONS:																			
3	New England.....		67	217,106	5	238	30	32,141	19	59,285	13	125,442	3	500	380	320,072	247	65,165	96	84,707
4	Middle Atlantic.....		43	164,888	4	607	18	16,339	9	30,076	12	117,866	—	—	322	838,261	96	26,085	114	113,706
5	East North Central.....		80	489,155	—	—	31	31,947	16	51,448	33	405,760	8	1,175	425	405,899	210	57,506	164	150,373
6	West North Central.....		34	140,959	2	600	16	15,319	6	14,720	10	110,320	21	5,965	126	299,114	50	12,679	48	48,935
7	South Atlantic.....		26	81,060	1	500	13	15,025	8	20,535	4	45,000	—	—	181	519,768	54	14,610	67	76,808
8	South Central.....		13	73,620	4	1,650	4	4,570	—	—	5	67,400	10	1,610	57	235,024	16	3,290	10	11,324
9	Mountain.....		13	40,882	2	544	8	8,890	—	—	3	31,448	1	25	239	597,588	50	13,667	122	127,571
	Pacific.....		55	359,537	4	1,275	17	19,934	12	40,329	22	297,999	2	1,087	265	877,166	55	19,468	96	103,183
10	NEW ENGLAND:																			
11	Maine.....		5	8,000	—	—	2	2,000	3	6,000	—	—	—	—	136	67,392	102	28,712	32	26,680
12	New Hampshire.....		1	8,000	—	—	—	—	—	—	1	8,000	2	450	50	49,425	31	7,475	11	9,950
13	Vermont.....		7	9,650	—	—	6	5,650	1	4,000	—	—	1	50	69	47,473	41	18,184	21	18,689
14	Massachusetts.....		22	84,480	—	—	12	13,633	7	29,215	3	41,642	—	—	79	122,170	41	9,126	21	17,434
	Rhode Island and Connecticut.....		32	106,966	5	238	10	10,858	8	20,070	9	75,800	—	—	46	33,612	32	6,658	11	11,964
15	MIDDLE ATLANTIC:																			
16	New York.....		31	106,190	3	107	16	14,973	6	19,410	6	71,700	—	—	264	680,526	85	22,626	75	77,440
	Pennsylvania.....		12	58,698	1	500	2	1,366	3	10,666	6	46,166	—	—	58	157,725	11	3,459	39	36,266
17	EAST NORTH CENTRAL:																			
18	Ohio and Indiana.....		9	42,400	—	—	3	3,850	3	12,680	3	25,870	1	350	83	37,001	71	22,351	12	14,650
19	Illinois.....		22	98,950	—	—	8	7,632	7	19,086	7	67,332	—	—	78	58,020	69	17,320	2	1,500
20	Michigan.....		35	307,502	—	—	11	9,762	6	19,682	18	278,056	—	—	172	179,810	33	10,597	114	82,413
	Wisconsin.....		14	45,303	—	—	9	10,803	—	—	5	34,500	7	825	92	131,068	37	7,238	36	51,810
21	WEST NORTH CENTRAL:																			
22	Minnesota.....		12	48,810	—	—	7	7,450	2	5,360	3	36,000	8	1,055	51	94,785	13	3,750	34	35,535
23	Iowa and Missouri.....		4	—	—	—	—	—	—	—	—	—	—	39	178,660	15	2,580	2	1,700	
24	South Dakota.....		3	7,750	—	—	1	1,070	3	6,680	—	—	—	9	6,750	2	800	7	6,150	
25	Nebraska.....		3	3,000	—	—	3	3,000	—	—	—	—	3	150	8	5,100	5	1,100	3	4,000
26	Kansas.....		15	81,399	2	600	5	3,799	1	2,680	7	74,320	10	4,780	19	15,819	15	4,669	2	1,550
27	SOUTH ATLANTIC:																			
28	Virginia and West Virginia.....		13	21,550	—	—	9	11,025	4	10,525	—	—	—	—	38	51,090	12	3,090	19	15,600
29	North Carolina.....		5	40,000	—	—	1	1,000	1	4,000	3	35,000	—	—	43	163,450	23	6,700	6	6,100
30	South Carolina.....		3	11,500	1	500	1	1,000	—	—	1	10,000	—	—	64	227,650	8	2,320	28	34,930
31	Georgia and Florida.....		5	8,010	—	—	2	2,000	3	6,010	—	—	—	—	36	77,578	11	2,500	14	20,178
32	SOUTH CENTRAL:																			
33	Tennessee.....		4	19,150	—	—	2	1,750	—	—	2	17,400	—	—	31	129,434	5	1,400	4	6,534
34	Alabama, Arkansas, and Texas.....		9	54,470	4	1,650	2	2,820	—	—	3	50,000	10	1,610	26	105,590	11	1,890	6	4,800
35	MOUNTAIN:																			
36	Montana.....		2	1,250	1	500	1	750	—	—	—	—	1	25	63	266,047	4	1,207	27	29,440
37	Idaho.....		—	—	—	—	—	—	—	—	—	—	—	—	48	49,395	14	2,000	31	29,195
38	Colorado.....		8	8,184	1	44	7	8,140	—	—	—	—	—	—	36	71,050	12	4,900	17	14,150
39	Arizona and Nevada.....		1	10,000	—	—	—	—	—	—	1	10,000	—	—	18	25,415	4	140	8	7,875
	Utah.....		2	21,448	—	—	—	—	—	—	2	21,448	—	—	74	185,681	16	5,420	39	46,911
40	PACIFIC:																			
41	Washington.....		6	20,666	—	—	4	4,999	1	2,667	1	13,000	—	—	37	109,328	9	2,728	13	14,800
42	Oregon.....		—	—	—	—	—	—	—	—	—	—	—	34	82,631	12	4,711	21	20,920	
43	California.....		49	338,871	4	1,275	13	14,985	11	37,662	21	284,999	2	1,087	194	735,207	34	12,029	62	67,463

DEVELOPMENT OF HYDROELECTRIC STATIONS.

47

OR MORE, BY GEOGRAPHIC DIVISIONS AND STATES: 1917—Continued.

PRIMARY POWER—continued.				DYNAMOS.		OUTPUT OF STATIONS (KILOWATT HOURS).		KILOWATT HOURS SOLD.				STATIONARY MOTORS SERVED.	
Water wheels and motors—Continued.								Total.	Light.	Power.	Other public service corporations.		
2,000 and under 5,000 horse-power.		5,000 horse-power and over.		Number.	Kilowatts.	Generated during year.	Purchased during year.	Total.	Light.	Power.	Other public service corporations.	Number.	Horse-power.
Number.	Horse-power.	Number.	Horse-power.										
232	745,662	268	2,418,133	2,427	3,954,294	13,924,464,619	2,094,442,371	13,148,946,560	1,120,506,702	7,523,445,685	4,504,994,173	145,032	3,360,371
25	80,300	12	90,000	412	389,594	924,499,033	290,607,255	1,096,562,682	102,918,624	451,063,437	482,580,621	28,772	255,412
38	121,760	74	576,700	396	656,224	3,081,473,392	572,767,350	3,284,881,664	95,570,914	2,030,318,413	1,158,992,387	21,538	267,579
41	134,920	10	63,100	479	671,046	2,206,681,721	55,909,119	1,704,499,578	279,325,245	880,088,367	545,065,966	41,608	453,201
9	32,000	19	206,500	214	313,605	1,026,906,025	145,184,289	1,039,149,033	112,501,630	432,002,663	404,644,440	15,703	286,797
21	70,450	39	357,900	301	388,567	1,082,172,773	140,962,613	1,067,316,757	34,274,308	823,585,525	199,456,926	5,677	138,419
10	32,800	21	187,500	113	229,318	827,436,151	325,765,066	726,426,471	28,422,900	213,113,231	486,800,340	1,846	24,773
30	101,150	37	355,200	275	420,672	1,861,067,154	234,330,816	1,786,187,445	87,048,367	1,342,657,226	356,486,853	10,234	506,865
58	172,282	56	582,233	337	874,268	2,934,338,370	328,926,883	2,511,922,930	380,449,416	1,350,616,824	780,856,600	19,654	1,398,326
8	32,000	2	12,000	99	53,227	158,646,180	25,009,494	159,882,109	15,270,840	91,031,499	53,579,780	2,807	47,737
7	15,600	7	63,000	55	42,510	125,556,049	1,299,805	114,447,106	8,827,071	17,083,448	88,536,586	2,287	28,909
10	32,600	7	63,000	81	42,596	55,474,173	17,672,069	60,303,567	5,908,503	32,611,451	21,783,608	2,351	30,844
		3	15,000	107	145,011	322,477,119	152,727,263	406,913,508	26,969,765	183,916,371	196,027,372	6,327	45,810
				70	106,260	262,342,512	92,896,624	265,016,403	45,942,445	126,420,678	122,653,280	15,000	102,112
38	121,760	66	458,700	312	504,234	2,278,006,625	571,294,980	2,639,865,852	82,969,964	1,800,806,721	756,089,167	17,229	205,800
		8	118,000	84	153,960	753,496,787	1,472,350	645,015,812	12,600,960	229,511,692	402,903,170	4,309	61,779
				25	58,212	125,046,931	5,241,280	105,306,738	12,329,780	54,655,705	38,320,283	3,015	37,084
		7	39,200	89	120,060	370,578,036	17,746,064	315,675,750	90,349,807	137,084,313	88,291,630	4,100	117,091
23	72,400	2	14,400	250	376,159	1,389,882,964	30,067,101	986,235,839	188,424,066	608,191,899	219,619,874	31,156	299,661
18	62,520	1	9,600	115	116,615	321,071,090	2,864,704	297,252,261	18,221,592	80,206,450	198,854,209	3,337	29,396
				85	98,096	370,537,183	122,601,178	412,560,335	89,339,036	239,499,712	83,731,587	12,410	205,459
		4	55,500	48	123,744	515,890,279	9,594,716	481,446,930	3,131,415	102,962,936	375,362,579	665	5,854
				20	10,110	15,267,373	1,406,100	12,222,882	3,816,677	7,660,721	1,745,484	1,098	10,576
				17	6,600	8,294,596		5,790,838	2,069,443	1,626,688	2,195,727	281	2,574
2	9,600			44	75,065	146,966,596	11,582,265	126,128,048	14,145,359	80,373,626	31,609,063	1,234	62,084
3	12,000	4	20,400	80	55,047	99,985,872	19,606,268	92,747,783	17,385,947	68,065,963	7,295,883	900	19,846
5	18,550	9	132,100	42	133,570	351,104,733	20,874,487	339,961,767	11,344,415	240,116,921	88,600,421	1,787	33,735
9	26,000	19	164,400	67	143,345	499,600,209	90,910,158	480,082,861	3,772,168	416,396,193	59,885,500	796	23,072
4	13,900	7	41,000	42	56,606	161,681,969	561,700	144,554,356	1,771,776	99,007,468	43,775,122	2,194	61,766
6	24,000	16	97,500	40	109,690	509,689,622	315,625,896	449,090,373	10,184,620	51,359,403	387,546,350	985	12,644
4	8,900	5	90,000	73	119,698	317,746,529	10,139,170	279,236,098	18,238,280	161,763,828	99,343,990	861	11,129
12	43,400	20	192,000	76	174,375	956,567,722	229,752,290	1,045,888,978	26,692,577	789,055,294	230,140,807	6,761	301,987
2	8,000	3	18,200	39	32,365	140,128,594	2,787,637	108,277,015	13,974,299	78,807,107	10,496,609	211	5,895
6	17,400	5	44,000	62	55,965	198,791,316	666,639	188,826,757	11,686,079	97,106,440	60,037,238	2,088	55,917
10	32,350	9	101,000	15	24,975	90,630,862		77,755,690	4,499,107	63,261,884	10,006,199	868	19,894
				83	141,992	474,928,960	124,261	390,436,006	30,301,006	314,427,000	45,808,000	306	122,170
6	20,600	9	71,300	50	86,340	229,761,993	1,130,756	182,549,826	80,936,217	115,778,448	15,835,161	4,676	57,225
		1	7,000	41	27,160	57,854,107	4,999,494	40,390,403	9,601,867	28,836,295	1,951,241	1,275	19,847
52	151,782	46	503,933	246	760,768	2,646,722,370	322,796,633	2,288,963,701	319,911,332	1,206,002,081	763,070,288	13,062	1,321,253

In order to make possible a further study of hydroelectric development in the United States, Table 29 has been prepared to show, by geographic divisions and states, the conditions which are found in large water-power stations. To avoid disclosing the conditions of individual plants, it has been necessary in several instances to group two or more states together. There are, also, 10 states and the District of Columbia which report no water-power plant having primary water-power equipment of 1,000 horsepower or over.

Geographic distribution.--From Table 29 it appears that these hydroelectric stations are most numerous (130) in the East North Central division, followed by the Pacific division (122) and the New England division (106). The largest stations, however, are to be found in the Pacific division and Middle Atlantic division. Among the different states, California leads with 87 stations, while Michigan and New York are next, reporting 59 and 56 stations, respectively. No other states approach these. In primary horsepower the Pacific (1,280,786), Middle Atlantic (1,043,847), and East North Central (941,636) divisions easily rank highest. The same divisions also report the highest dynamo capacity, though the order of the last two is reversed. Evidently the Middle Atlantic division has a good deal of excess water horsepower developed, which will later call for an additional amount of generating equipment. It is further surprising to find that the Middle Atlantic division, which stands third in generating capacity, reports the highest amount of current generated, 3,031,473,392 kilowatt hours, as contrasted with 2,934,338,370 in the Pacific division and 2,206,581,721 in the East North Central. This is due to the better load factor and

diversity factor which can be secured in the highly developed industrial centers. As might be expected, the hydroelectric plants of California report more horsepower in the aggregate (1,114,356) than do those of any other state. New York ranks second (822,224), followed by Michigan (504,719). In dynamo capacity and number of kilowatt hours generated these states also lead by a wide margin.

The Pacific division reports an investment in hydroelectric stations of \$401,887,714, an amount which is almost double that reported by the nearest rivals, the Mountain (\$213,566,487) and the East North Central (\$206,522,074). The Pacific division again leads in the income from sale of current (\$37,598,520), while the Mountain division, which is second in investment, ranks only fifth in income from electric current sold (\$16,706,120). California, New York, Michigan, and Montana, which report the highest investment, also report the highest income from electric service. The average income per kilowatt hour sold in the Middle Atlantic division, about 6.3 mills, is lower than in any other division. This is followed by the South Central, with an average rate of nearly 7 mills. Among the several states, South Carolina shows the lowest average rate for all current sold, 4.3 mills. New York reports about 6.2 mills, and Pennsylvania and Montana about 7 mills. The average rate in California, where current must be transmitted over long distances, is about 1.5 cents. It must, however, be remembered that the nature of the service rendered, together with the local conditions, determines what is a reasonable rate for electric service, and no account of these differences can be shown in the general statistics for the industry.

CHAPTER IV.—PRIMARY POWER EQUIPMENT.

Central electric stations and electric railways.—As in 1912, the census of 1917 called for a return of the different types of primary power machines used by central electric stations, together with their number and horsepower capacity. Similar data were collected for central electric stations and for electric railways.

As indicated in Chapter II (p. 21), there are numerous isolated plants producing electric current in addition to those public utilities covered by this census, but the combined data for electric stations and street railways indicate the nature of all important changes in the industry.

Table 30

CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—NUMBER, TYPE, AND HORSEPOWER OF PRIMARY POWER MACHINES: 1917, 1912, AND 1907.

	Total.		Type of prime movers.									
			Total steam.		Steam engines.		Steam turbines.		Internal-combustion engines.		Water wheels and turbines.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
Total:												
1917.....	15,905	17,136,947	9,228	11,992,991	6,965	2,922,900	2,268	9,070,091	2,987	288,700	3,690	4,905,256
1912.....	14,591	11,191,429	10,105	8,115,666	8,609	2,598,470	1,496	4,517,196	1,164	135,225	3,322	2,940,838
1907.....	14,635	6,618,011	11,422	5,104,800	10,798	3,751,966	629	1,352,814	804	72,163	2,709	1,441,048
Central stations:												
1917.....	12,795	12,986,755	7,487	8,449,076	5,788	1,701,677	1,699	6,747,399	2,984	210,406	3,374	4,277,278
1912.....	11,902	7,530,044	7,847	4,949,778	6,813	1,895,382	1,034	3,054,396	1,116	111,035	2,939	2,496,281
1907.....	10,968	4,098,188	8,064	2,698,273	7,677	1,875,863	377	817,410	468	55,828	2,481	1,349,087
Electric railways:												
1917.....	2,110	4,200,192	1,741	3,543,915	1,177	1,221,223	564	2,322,692	53	26,294	316	627,983
1912.....	2,689	3,661,835	2,258	3,165,898	1,796	1,703,068	463	1,462,800	48	34,190	388	471,307
1907.....	3,637	2,519,823	3,368	2,411,527	3,116	1,876,123	252	535,404	41	16,335	228	91,961
PER CENT OF INCREASE. ¹												
Total:												
1907-1917.....	8.7	158.9	-19.2	134.9	-35.5	-22.1	259.8	570.5	492.6	330.8	36.2	240.4
1912-1917.....	9.0	53.1	-8.7	47.8	-19.1	-18.8	51.3	100.8	156.6	78.5	11.1	66.8
1907-1912.....	-0.3	60.1	-11.5	59.0	-20.2	-4.1	137.8	233.9	131.0	87.4	22.6	104.0
Central stations:												
1907-1917.....	25.4	215.7	-7.0	213.7	-24.6	-9.3	380.7	725.5	533.7	276.9	36.0	217.0
1912-1917.....	15.9	71.8	-4.6	70.7	-15.0	-10.2	64.3	120.9	162.9	89.5	14.8	73.2
1907-1912.....	8.2	83.7	-2.6	83.8	-11.3	1.0	174.3	273.7	141.0	98.9	18.5	83.0
Electric railways:												
1907-1917.....	-42.0	66.7	-48.3	47.0	-62.2	-34.9	123.8	333.8	.....	73.2	38.6	582.9
1912-1917.....	-21.5	14.7	-22.9	11.9	-34.5	-28.3	22.1	58.8	.....	17.0	-17.5	33.2
1907-1912.....	-26.1	45.3	-23.0	31.3	-42.4	-9.2	83.3	173.2	.....	48.1	68.0	412.5

¹ A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

Accordingly, Table 30 shows the actual increase in number and horsepower of all prime movers for both central stations and electric railways, together with the per cent of increase or decrease in the respective items. From this table it appears that the growth in total horsepower of all kinds for the electric railways has been comparatively slow during the last decade (66.7 per cent), but particularly during the period 1912-1917, when the increase was only 14.7 per cent. However, the rapid decrease in the number of different units, amounting to 42 per cent during the decade, indicates a very marked increase in the size of primary power machines for electric railways. Central stations, on the other hand, not only show some increase in the number of machines, 25.4 per cent during the decade, but also a growth in horsepower more than three times as rapid as that of the street railways (215.7 per cent as opposed to 66.7 per cent). At the present time electric railways have 2,110 prime movers, or 13.3 per cent of the total for electric stations

and street railways (15,905), while they report a horsepower of 4,200,192, or 24.5 per cent of the total horsepower (17,136,947).

An examination of the different types of prime movers shows that steam engines have been rapidly displaced by the larger and more efficient steam turbines, which are usually directly connected with an electric generator and occupy far less space than the old reciprocating engines. There has been a rapid decrease both in number and horsepower of steam engines, particularly in the case of the electric railways, where the decrease for the decade has been 62.2 per cent and 34.9 per cent, respectively. The change has been far less marked for central stations. At the present time, however, steam engines furnish 29.1 per cent of the total horsepower reported by street railways, while steam turbines furnish 55.3 per cent. Water wheels and turbines are relatively of much less importance, supplying only 15 per cent of total horsepower, while internal-combustion engines are scarcely used.

DIAGRAM 1.—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—PRIMARY POWER, BY STATES: 1917.

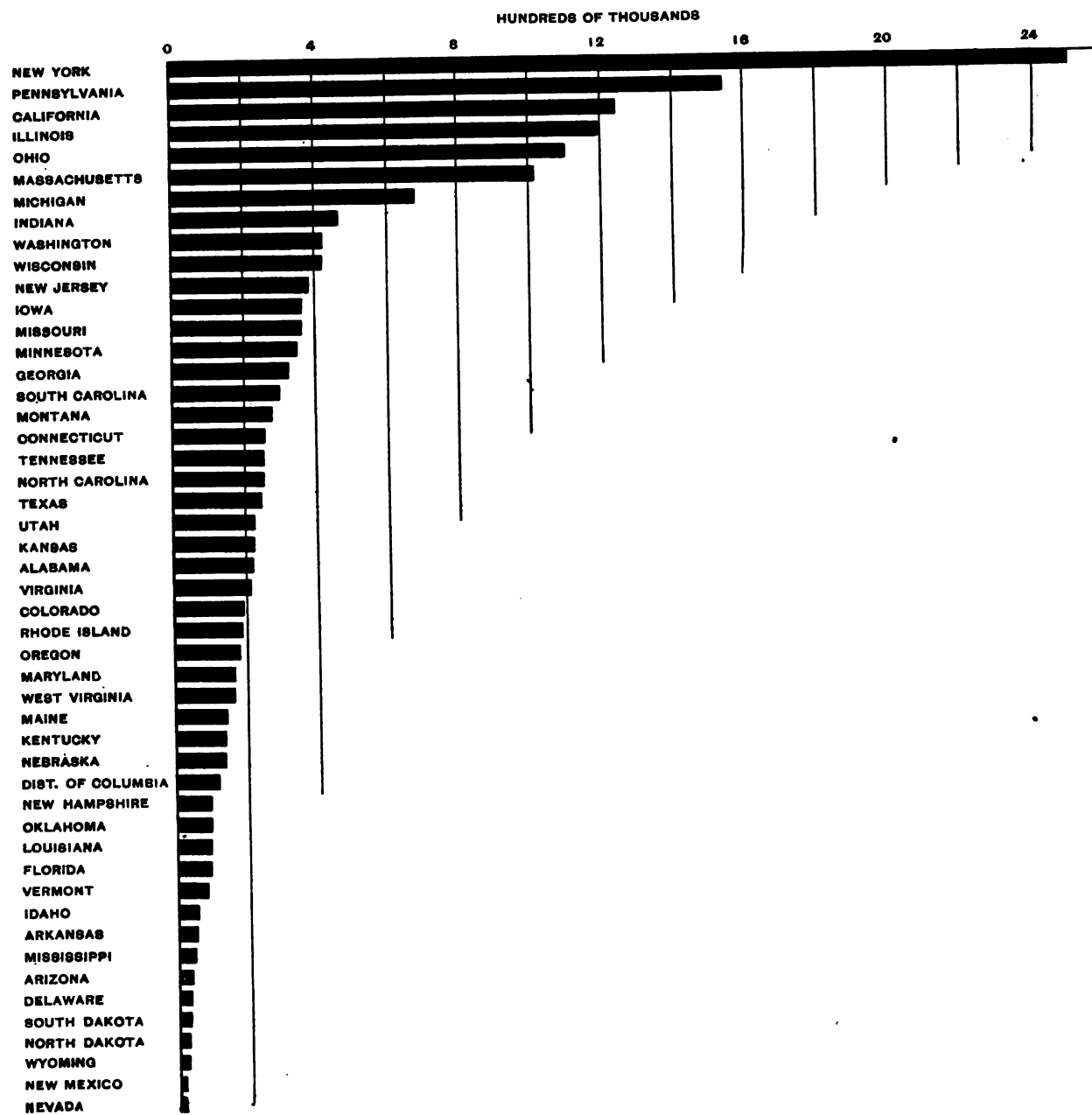


DIAGRAM 2.—PRIMARY POWER, BY CHARACTER OF POWER: 1917.

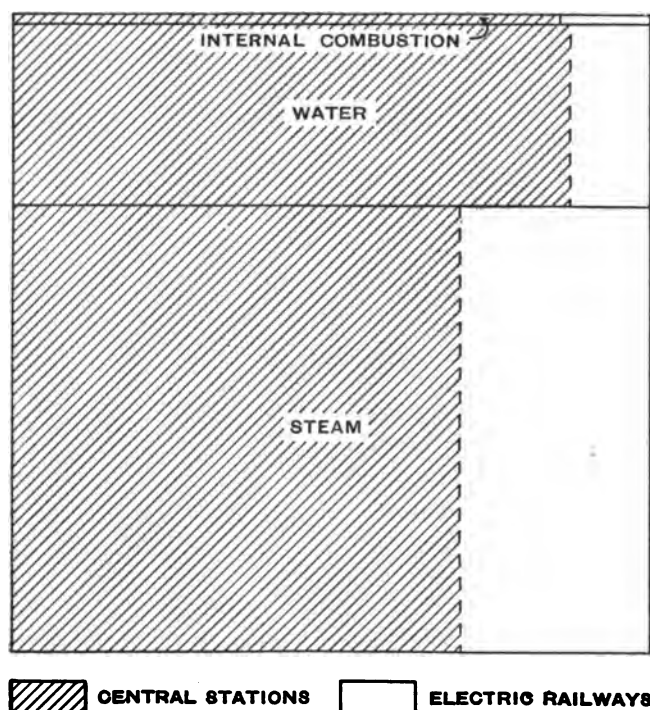
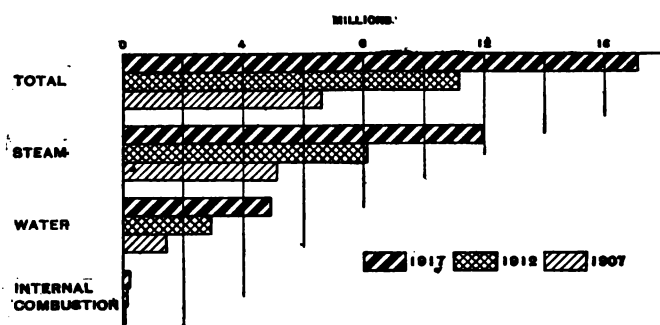


DIAGRAM 3.—PRIMARY HORSEPOWER, BY CHARACTER OF POWER: 1917, 1912, AND 1907.



Central electric stations, on the other hand, report only 13.2 per cent of their horsepower in steam engines, compared with 52.2 per cent in steam turbines, and 33.1 per cent in water wheels. They further return a surprisingly large number of internal-combustion engines, 2,934, which, however, furnish only 1.6 per cent of the horsepower. Finally, it is interesting to find that in every instance the prime movers reported by the street railways are, on the average, much larger than those of electric stations. The former report average horsepower as follows: Steam engines, 1,038; steam turbines, 4,118; water wheels, 1,987; internal-combustion engines, 534. Central stations show an average horsepower of 294 for steam engines, 3,971 for steam turbines, 1,268 for

water wheels and turbines, and 72 for internal-combustion engines.

General comparison of commercial and municipal stations.—Table 31 shows the relations which exist between the primary power equipment of commercial and municipal central electric stations.

It appears from Table 31 that although municipal stations report 3,408 units, or 24.7 per cent of the total number of prime movers, they have only 859,098 horsepower, or 6.6 per cent of the total. An examination of the per cent of increase shows that, while the municipal plants have reported an increase of 13.2 per cent in the number of steam engines since 1907 and of 29.2 per cent in their horsepower during the same period, commercial plants have experienced a marked decrease of 35.8 per cent in the number of steam engines and of 15.6 per cent in the horsepower of such machines. These figures probably indicate, first, that municipal plants are not generally replacing their old steam engines by steam turbines as are the other group, or, secondly, some may be installing old steam engines instead of steam turbines, in the hope of keeping capital expenditures as low as possible. It does appear, however, that the rate of increase in the number of steam turbines has been much more rapid during the decade for municipal stations than for commercial stations, due to the fact that at the earlier period the former used practically none of this type of prime movers. As will be indicated, however, the relative importance which steam turbines bear to other types of primary power machines is markedly less in the case of municipal plants. The number of internal-combustion engines has been increasing very rapidly for both groups of stations, while the total horsepower has shown by far the greater growth in municipal plants during the past five years—176 per cent as opposed to only 67.6 per cent for the other group of stations. In the matter of water wheels and turbines, municipal plants report a decrease of 1.5 per cent in number during the period from 1912 to 1917, though the decade shows an increase of 73.2 per cent. Commercial plants, on the other hand, have shown a steady growth in number of this type of prime mover during each five-year period. Further, the horsepower capacity of water wheels and turbines in commercial plants has also increased at practically the same rate during the two periods (77.4 and 74.3 per cent, respectively). While for municipal plants there was reported a very small amount of such power in 1907, the growth was very rapid until 1912 (329.2 per cent), and since that year the rate of increase (53.8 per cent) has been relatively slow.

Table 31

Table 31		COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER, TYPE, AND HORSEPOWER OF PRIMARY POWER MACHINES: 1917, 1912, AND 1907.											
CLASS OF STATIONS.		Type of prime movers.											
		Total.		Type of prime movers.									
				Total steam.		Steam engines.		Steam turbines.		Internal-combustion engines.		Water wheels and turbines.	
Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.	Num-ber.	Horse-power.		
Total:													
1917.....		13,795	12,936,755	7,487	8,449,076	5,788	1,701,677	1,699	6,747,399	2,934	210,406	3,374	4,277,273
1912.....		11,902	7,530,044	7,847	4,949,778	6,813	1,895,382	1,034	3,054,396	1,116	111,035	2,939	2,469,231
1907.....		10,998	4,098,188	8,054	2,693,273	7,677	1,875,863	377	817,410	463	55,828	2,481	1,349,087
Commercial:													
1917.....		10,387	12,077,657	5,287	7,852,205	3,799	1,358,691	1,488	6,493,514	1,991	148,574	3,109	4,076,878
1912.....		9,325	8,970,716	5,823	4,543,112	4,902	1,588,889	921	2,954,223	833	88,634	2,670	2,338,970
1907.....		8,961	3,776,837	6,268	2,408,351	5,920	1,610,326	348	798,025	385	49,746	2,328	1,318,740
Municipal:													
1917.....		3,408	859,098	2,200	596,871	1,989	342,986	211	253,885	943	61,832	265	200,395
1912.....		2,576	559,328	2,024	406,666	1,911	306,493	113	100,173	283	22,401	269	130,261
1907.....		2,017	321,351	1,786	284,922	1,757	265,537	29	19,385	78	6,082	153	30,347
PER CENT OF INCREASE. ¹													
Total:													
1907-1917.....		25.4	215.7	-7.0	213.7	-24.6	-9.3	350.7	725.5	533.7	276.9	36.0	217.0
1912-1917.....		15.9	71.8	-4.6	70.7	-15.0	-10.2	64.3	120.9	162.9	89.5	14.8	
1907-1912.....		8.2	83.7	-2.6	83.8	-11.3	1.0	174.3	273.7	141.0	98.9	18.5	83.0
Commercial:													
1907-1917.....		15.6	219.8	-15.7	226.0	-35.8	-15.6	327.6	713.7	417.1	198.7	33.5	209.1
1912-1917.....		11.4	73.3	-9.2	72.8	-22.5	-14.5	61.6	119.8	139.0	67.6	16.4	74.3
1907-1912.....		3.8	84.6	-7.1	88.6	-17.2	-1.3	164.6	270.2	116.4	78.2	14.7	77.4
Municipal:													
1907-1917.....		69.0	167.3	23.2	109.5	13.2	29.2	.....	1,209.7	.....	916.6	73.2	560.3
1912-1917.....		32.3	53.6	8.7	46.8	4.1	11.9	86.7	153.4	233.2	176.0	-1.5	53.8
1907-1912.....		27.7	74.1	13.3	42.7	8.8	15.4	.....	416.8	.....	268.3	75.8	329.2

¹ A minus sign (-) denotes decrease. Percentages are omitted when base is less than 100.

Table 32

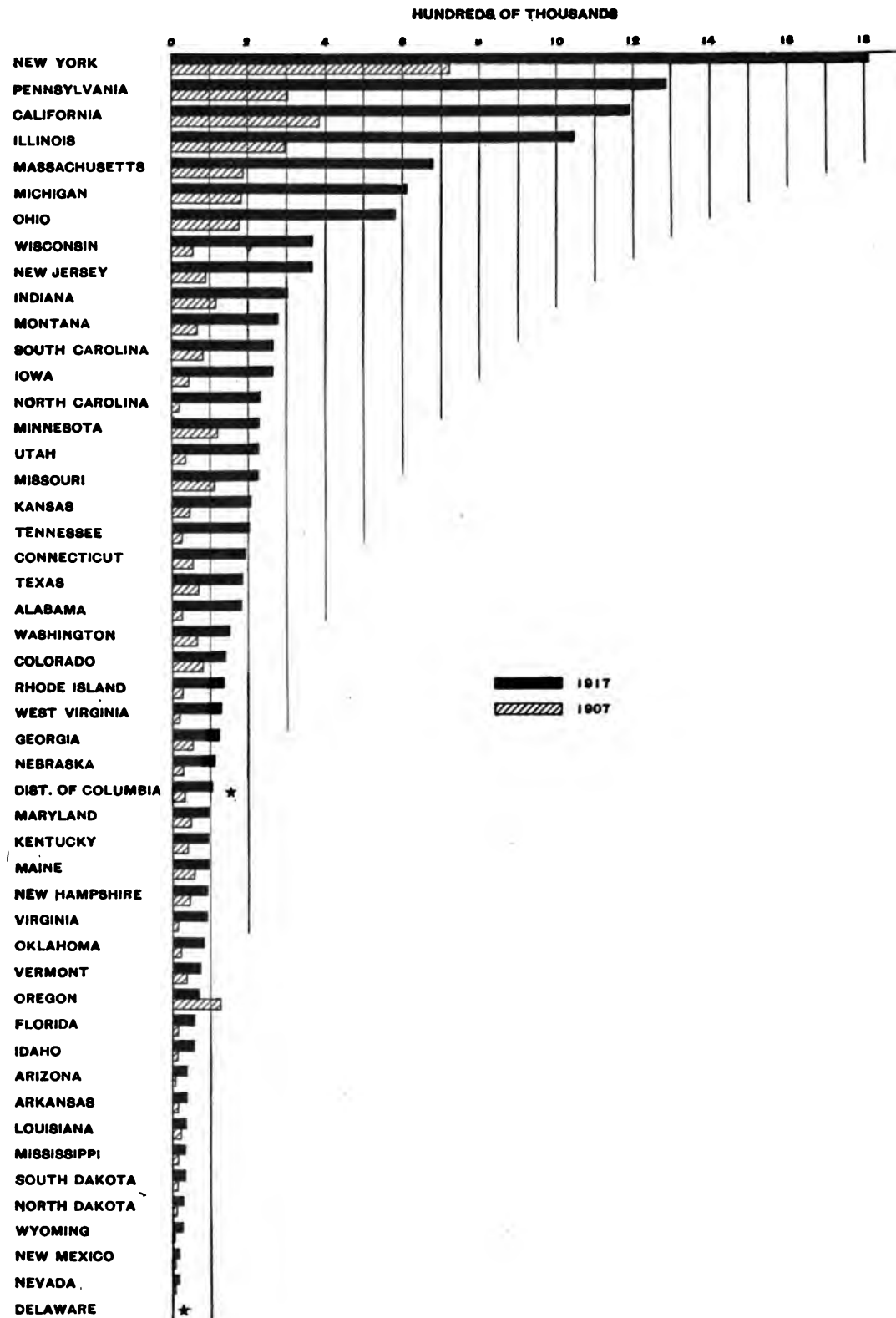
CLASS OF STATIONS.		Cen-sus year.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT DISTRIBUTION OF DIFFERENT TYPES OF PRIME MOVERS.							
			Steam engines.		Steam turbines.		Internal-combustion engines.		Water wheels and turbines.	
			Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
Total		1917	42.0	13.2	12.3	52.2	21.3	1.6	24.5	33.1
		1912	57.2	25.2	8.7	40.6	9.4	1.5	24.7	32.8
		1907	69.8	45.8	3.4	19.9	4.2	1.4	22.6	32.9
Commercial		1917	36.6	11.2	14.3	53.8	19.2	1.2	29.9	33.8
		1912	52.6	22.8	9.9	42.4	8.9	1.3	28.6	33.6
		1907	65.9	42.6	3.9	21.1	4.3	1.3	25.9	34.9
Municipal		1917	58.4	39.9	6.2	29.6	27.7	7.2	7.8	23.3
		1912	74.2	54.8	4.4	17.9	11.0	4.0	10.4	23.3
		1907	87.1	82.6	1.4	6.0	3.9	1.9	7.6	9.4

Perhaps a better understanding of the relative importance of the different types of prime movers can be secured from Table 32, which shows the percentage distribution of each type according to number and horsepower of machines. For 1917 steam turbines rank first in importance in the case of commercial stations, comprising 53.8 per cent of the total horsepower, though ranking lowest in number of units. In this group of plants steam engines are still the most numerous (36.6 per cent of the total), though they

rank only third in horsepower (11.2 per cent). There has been a complete reversal of the relative importance of these two types of prime movers since 1907. Water wheels and turbines have, throughout the decade, maintained practically the same position, furnishing at the present time 33.8 per cent of the total horsepower of commercial stations and ranking second in the number of separate machines. Internal-combustion engines, while of almost negligible capacity, comprise 19.2 per cent of the total number of prime movers.

Municipal plants furnish some interesting and rather surprising contrasts; for these, steam engines are still far in the lead, both in number and in horsepower. In fact, the per cent of horsepower comprised by these machines is relatively about three and one-half times as great as in the case of the commercial stations, though there has been a constant decrease in comparative importance since 1907. Steam turbines rank second in horsepower (29.6 per cent), but last in number (6.2 per cent); water wheels and turbines have shown no increase in percentage distribution since 1912, and have been subject to a numerical decrease. Finally, internal-combustion engines have shown a marked growth, relatively, both in number and horsepower, due, no doubt, to the fact that such prime movers lend themselves readily and economically to the uses of small stations.

DIAGRAM 4.—CENTRAL ELECTRIC STATIONS—PRIMARY POWER, BY STATES: 1917 AND 1907.



Extent of use of the different types of prime movers, together with their average size.—In Table 33 is shown the number of stations which report the different types of prime movers. These figures should be studied in their relation to the number of plants which actually have generating equipment as opposed to the entire number of stations reporting. In 1917 there were 3,417 commercial plants supplied with generating equipment, though only 3,347 of these actually produced current. There were also 1,826 municipal plants in this class, while 1,777 actually generated current. There are, to be sure, a few stations which, while having generating equipment, do not possess primary power machines, as their motive power is purchased from companies which supply mechanical power in the form of water or steam. These, however, are very few in number, and the figures above given can be regarded as practically correct. It is, of course, obvious that many stations report several different types of prime movers.

TYPE OF PRIME MOVERS.	Census year.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—DISTRIBUTION BY NUMBER OF STATIONS AND BY TYPES OF PRIME MOVERS: 1917, 1912, AND 1907.		
		Number of stations.		
		Total.	Commercial.	Municipal.
Steam engines.....	1917	2,920	1,745	1,175
	1912	3,529	2,338	1,191
	1907	3,704	2,606	1,098
Steam turbines.....	1917	656	531	125
	1912	454	388	66
	1907	187	170	17
Internal-combustion engines.....	1917	1,802	1,222	580
	1912	713	518	195
	1907	294	238	56
Water wheels and turbines.....	1917	1,079	938	141
	1912	1,035	915	120
	1907	910	821	89

It appears from Table 33 that 1,745 commercial plants, or 51.1 per cent of all having generating equipment, still report the use of steam engines. This is a very high percentage, even though there has been in the last five years a decrease in the number of such stations amounting to 593, or 25.4 per cent. The number of municipal plants reporting steam engines is 1,175, or 64.3 per cent of all stations which have generating equipment, and there has been a decrease of only 1.3 per cent in number since 1912, while there was actually an 8.5 per cent gain between 1907 and 1912, though during the same period there was a decrease of 10.3 per cent in the number of commercial plants so reporting. Steam turbines are returned by 15.5 per cent of commercial plants, as opposed to only 6.8 per cent of municipal plants. Internal-combustion engines are found in 35.8 per cent of the former and 31.8 per cent of the latter. However, 27.5 per cent of the commercial plants have water wheels or turbines, while only 7.7 per cent of municipal plants are supplied with this kind of power.

From Table 34 it can be seen that while there has been a rapid growth since 1912 in the average total horsepower per commercial station, from 1,905 to 2,859, there has been an increase of only 13 during the past five years in the average horsepower per municipal station. These figures, of course, are based on the total number of stations, whether or not they generate current. Were we to consider only those stations which report generating equipment, as suggested above, it would be found that in 1917 the average horsepower per commercial station was 3,535, while the average per municipal station at the same date was 470. The average horsepower per machine for commercial plants has increased during the decade from 421 to 1,163, a gain of 176.2 per cent, as compared with an increase for municipal plants from 159 to 252, or only 58.5 per cent.

TYPE OF PRIME MOVERS.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE PRIMARY HORSEPOWER PER STATION AND PER MACHINE.								
	Total.			Commercial.			Municipal.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907
Total power:									
Per station.....	1,977	1,442	869	2,859	1,905	1,091	371	358	257
Per machine.....	938	633	373	1,163	747	421	252	217	159
Steam engines and steam turbines:									
Per machine.....	1,128	631	365	1,485	780	427	271	201	165
Steam engines—									
Per station.....	583	537	489	779	680	593	292	257	240
Per machine.....	294	278	265	358	324	301	172	160	157
Steam turbines—									
Per station.....	10,286	6,728	4,371	12,229	7,614	4,664	2,031	1,518	1,140
Per machine.....	3,971	2,954	2,168	4,364	3,208	2,293	1,203	886	668
Internal-combustion engines:									
Per station.....	117	156	190	122	171	209	107	115	109
Per machine.....	72	99	121	75	106	129	66	79	78
Water wheels and turbines:									
Per station.....	3,964	2,386	1,483	4,346	2,556	1,606	1,421	1,086	341
Per machine.....	1,268	847	544	1,311	876	566	756	484	198

So far as the different types of prime movers are concerned, it is evident that there has been comparatively little increase either in the horsepower per station or per machine for steam engines. Steam turbines, however, have shown a rapid increase in both of these respects, particularly in the case of commercial plants, which in 1912 showed an average per plant reporting such machines of 12,229 horsepower, an absolute gain of 7,535 horsepower over 1907. The average horsepower per machine for this group, also, nearly doubled, from 2,293 in 1907 to 4,364 in 1917. The rate of increase in steam-turbine capacity per station reporting was much less rapid for municipal plants, though the average capacity per machine showed about the same growth. There has been a marked increase, both in the horsepower per station and in the average per machine, for water wheels and turbines, and the proportionate increase has in each instance been more marked for municipal plants. It is, finally, surprising to find that there has been a very noticeable decrease in the average capacity of internal-combustion engines as well as in their horsepower per station. For municipal plants the change has not

been appreciable since 1907, but in the other group there has been a drop from 209 horsepower to 122 horsepower in the station average and from 129 horsepower to 75 horsepower in the average per machine. This decrease in average size of internal-combustion engines is largely occasioned by the fact that there have been so many new and very small commercial plants installed since 1912, particularly in those groups which are not incorporated. For municipal plants, on the other hand, the most rapid rate of increase took place among those small plants which purchase all their current, and, accordingly, the size of the primary power units would be little affected. In this connection it is interesting to observe that the state of New York reports primary power of all kinds far in excess of the capacity returned by any other state, 1,811,066 horsepower, or about 14.2 per cent of the total for the United States. Three other states—Pennsylvania, California, and Illinois—report more than 1,000,000 horsepower. These four states furnish 41.3 per cent of the aggregate for the United States.

Stations reporting only one type of prime mover.—In Table 33 the number of stations reporting the different types of prime movers is given. At this point, however, some mention should be made of those

stations which report only one type of prime mover, together with the number and horsepower capacity of such machines. Accordingly, in Table 35 are assembled some significant data bearing on this question. It appears, in the first place, that the total number of such stations, 4,144, is equal to 63.3 per cent of all central stations in the United States and 79 per cent of all stations supplied with generating equipment. They also report a total horsepower of 3,661,679, or 28.3 per cent of the United States total. Nearly 38.7 per cent of all generating stations, 2,028, report steam engines only, while 27.1 per cent, or 1,423, are supplied only with internal-combustion engines. That these plants reporting only one type of prime mover are usually the smaller plants is indicated by the fact that, while they return 55.8 per cent of the total number of primary power machines, the total capacity of the same is little more than one-fourth (28.3 per cent) of the total horsepower reported at this census. The averages per station and per machine are less than the corresponding averages for the United States given in Table 34, except in the case of the averages shown for steam turbines in municipal stations and the average per machine for water wheels and turbines in these stations, which are higher.

Table 35

CENTRAL ELECTRIC STATIONS REPORTING ONLY ONE TYPE OF PRIME MOVER: 1917.

	Total.			Commercial.			Municipal.		
	Number of stations.	Number of machines.	Horsepower.	Number of stations.	Number of machines.	Horsepower.	Number of stations.	Number of machines.	Horsepower.
Total.....	4,144	7,098	3,661,679	2,519	4,911	3,095,298	1,625	2,787	566,381
Steam engines only.....	2,028	3,590	626,939	1,026	1,874	345,407	1,002	1,716	281,532
Steam turbines only.....	145	406	1,220,017	110	326	1,108,337	35	80	114,080
Internal-combustion engines only.....	1,423	2,348	133,439	925	1,515	83,030	498	833	50,409
Water wheels and turbines only.....	548	1,354	1,681,294	458	1,196	1,561,524	90	158	119,760
Average per station:									
Steam engines.....		2	309		2	337		2	281
Steam turbines.....		3	8,414		3	10,049		2	3,277
Internal-combustion engines.....		2	94		2	90		2	101
Water wheels and turbines.....		2	3,068		2	3,409		2	1,331
Average per machine:									
Steam engines.....			175			184			164
Steam turbines.....			3,005			3,391			1,434
Internal-combustion engines.....			57			55			61
Water wheels and turbines.....			1,242			1,306			758
Per cent of United States totals:									
Total.....	63.3	55.8	28.3	59.6	47.3	25.6	70.1	81.8	65.9
Steam engines.....	31.0	62.0	36.8	24.3	40.3	25.4	43.2	86.3	82.1
Steam turbines.....	2.2	23.9	18.1	2.6	21.9	17.0	1.5	37.9	45.2
Internal-combustion engines.....	21.8	30.0	63.4	21.9	76.1	55.9	21.5	88.3	81.5
Water wheels and turbines.....	8.4	40.1	39.3	10.8	38.5	38.3	3.9	59.6	59.8
Per cent of stations having generating equipment:									
Total.....	79.0			73.7			89.0		
Steam engines.....	38.7			30.0			54.9		
Steam turbines.....	2.8			3.2			1.9		
Internal-combustion engines.....	27.1			27.1			27.3		
Water wheels and turbines.....	10.5			13.4			4.9		

The number of commercial establishments which report only one type of machine, 73.7 per cent of those stations having generating equipment, is relatively less important than the corresponding number of municipal plants, which amounts to 89 per cent of this group. In only one instance, however, have these commercial plants reported more than half the primary horsepower of a given kind, 55.9 per cent—that is, in the case of those stations having only internal-combustion

engines. The municipal plants in this group, on the other hand, in all instances except one, report by far the greater part of the total municipal horsepower. As is also the case with commercial plants, the lowest relative amount of horsepower is reported by those municipal plants equipped only with steam turbines (45.2 per cent). All of the averages per station and per machine are closer to the United States total averages for the given group in the case of municipal plants.

In two instances they are even considerably higher. Steam turbines average 3,277 horsepower per station and 1,434 horsepower per machine, as opposed to United States averages for municipal plants of 2,031 and 1,203, respectively. The average capacity of water wheels and turbines per station is 1,331 horsepower per station and 758 per machine, while the total averages are 1,421 and 756, respectively.

Steam power.—It is perhaps worth while to examine somewhat more closely the changes which have been taking place in the different classes of primary power units according to their size. Accordingly, in Table 36 this phase of development has been shown for steam engines and steam turbines since 1907. These machines, of course, secure their motive power, in the main, through the use of coal for fuel under the boilers.

The fact, however, must not be overlooked that not all steam is produced in this way. In some sections where oil is abundant and low in price and coal is relatively scarce, the former is actually burned under the boilers in place of other fuel. This frequently happens in Texas, Oklahoma, and parts of California. Gas is also sometimes used. In other sections of the country waste material of different sorts, particularly the refuse from sawmills, is largely or even wholly used in the smaller generating plants in place of coal. These instances are most numerous in some of the Southern states, particularly in Georgia and the Carolinas. More detailed reference to the different kinds of fuel used in steam plants will be made later in the chapter on "Financial statistics."

Table 36

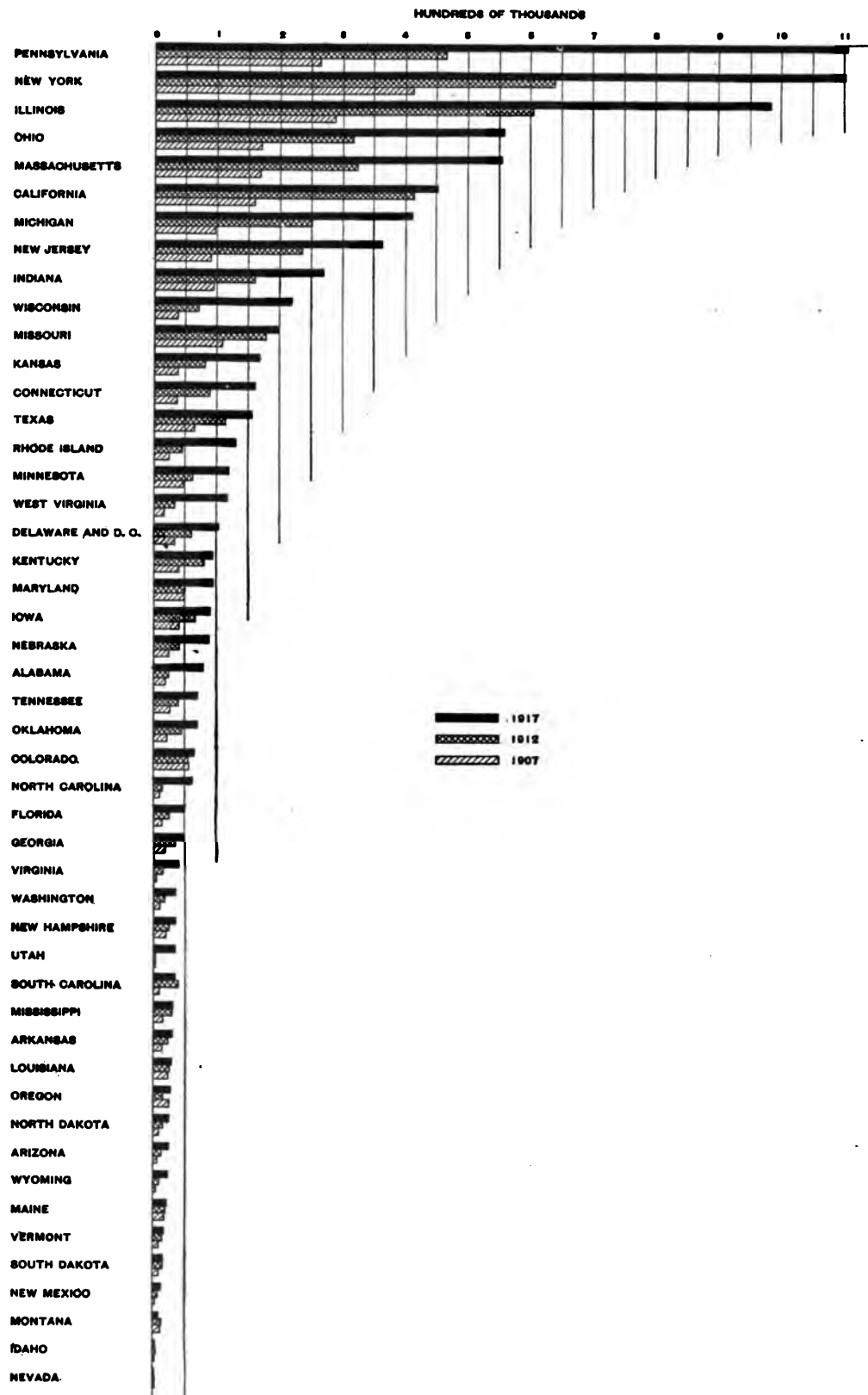
COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—STEAM ENGINES AND STEAM TURBINES, BY HORSEPOWER CAPACITY: 1917, 1912, AND 1907.

CLASS OF STATIONS.	Total.		Engines grouped according to horsepower.							
			500 horsepower or under.		Over 500 and under 2,000 horsepower.		2,000 and under 5,000 horsepower.		5,000 horsepower and over.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
Total:										
1917.....	7,487	8,440,076	5,509	906,901	1,188	1,188,319	388	1,158,816	402	5,104,950
1912.....	7,847	4,949,778	6,329	1,092,175	1,045	980,992	294	845,381	179	2,031,230
1907.....	7,206	2,627,450	6,248	1,035,583	747	661,746	148	407,695	63	522,426
Commercial:										
1917.....	5,287	7,852,205	3,488	661,780	1,040	1,054,894	365	1,067,565	394	5,047,966
1912.....	5,823	4,543,112	4,399	796,156	964	906,729	281	806,997	179	2,031,230
1907.....	5,492	2,344,032	4,584	794,205	699	625,006	146	402,395	63	522,426
Municipal:										
1917.....	2,200	596,871	2,021	335,211	148	133,425	23	71,251	8	56,984
1912.....	2,024	406,666	1,930	296,019	81	74,263	13	36,384		
1907.....	1,714	283,418	1,664	241,378	48	36,740	2	5,300		
STEAM ENGINES.										
Total:										
1917.....	5,788	1,701,677	5,200	906,987	484	454,039	87	233,274	17	107,407
1912.....	6,813	1,895,382	6,137	1,038,495	568	510,839	92	240,794	16	105,254
1907.....	6,829	1,810,040	6,183	1,018,566	557	489,694	70	186,280	19	115,500
Commercial:										
1917.....	3,799	1,358,691	3,253	593,538	442	424,472	87	233,274	17	107,407
1912.....	4,902	1,588,889	4,253	753,542	541	489,299	92	240,794	16	105,254
1907.....	5,144	1,546,007	4,535	781,673	520	462,554	70	186,280	19	115,500
Municipal:										
1917.....	1,989	342,986	1,947	313,419	42	29,567				
1912.....	1,911	306,493	1,884	284,953	27	21,540				
1907.....	1,685	264,033	1,648	236,893	37	27,140				
STEAM TURBINES.										
Total:										
1917.....	1,699	6,747,399	309	90,034	704	734,280	301	925,542	385	4,997,543
1912.....	1,034	3,054,395	192	53,680	477	470,153	202	604,587	163	1,925,976
1907.....	377	817,410	65	17,017	190	172,052	78	221,415	44	406,926
Commercial:										
1917.....	1,488	6,493,514	235	68,242	598	630,422	278	854,291	377	4,940,589
1912.....	921	2,954,223	146	42,614	423	417,430	189	568,203	163	1,925,976
1907.....	348	798,025	49	12,532	179	162,452	76	216,115	44	406,926
Municipal:										
1917.....	211	253,885	74	21,792	106	103,858	23	71,251	8	56,984
1912.....	113	100,173	46	11,066	54	52,723	13	36,384		
1907.....	29	19,385	16	4,485	11	9,600	2	5,300		
PER CENT DISTRIBUTION.										
Total:										
1917.....	100.0	100.0	89.8	53.3	8.4	26.7	1.5	13.7	0.3	6.3
1912.....	100.0	100.0	90.1	54.8	8.3	27.0	1.4	12.7	0.2	5.6
1907.....	100.0	100.0	90.5	56.3	8.2	27.1	1.0	10.3	0.3	6.4
Commercial:										
1917.....	100.0	100.0	85.6	43.7	11.6	31.2	2.3	17.2	0.4	7.9
1912.....	100.0	100.0	86.8	47.4	11.0	30.8	1.9	15.2	0.3	6.6
1907.....	100.0	100.0	88.2	50.6	10.1	29.9	1.4	12.0	0.4	7.5
Municipal:										
1917.....	100.0	100.0	97.9	91.4	2.1	8.6				
1912.....	100.0	100.0	98.6	93.0	1.4	7.0				
1907.....	100.0	100.0	97.8	89.7	2.2	10.3				
STEAM TURBINES.										
Total:										
1917.....	100.0	100.0	18.2	1.3	41.4	10.9	17.7	13.7	22.7	74.1
1912.....	100.0	100.0	18.6	1.8	46.1	15.4	19.5	19.8	15.8	63.1
1907.....	100.0	100.0	17.2	2.1	50.4	21.0	20.7	27.1	11.7	49.8
Commercial:										
1917.....	100.0	100.0	15.8	1.1	40.2	9.7	18.7	13.2	25.3	76.1
1912.....	100.0	100.0	15.9	1.4	45.9	14.1	20.5	19.3	17.7	65.2
1907.....	100.0	100.0	14.1	1.6	51.4	20.4	21.8	27.1	12.6	51.0
Municipal:										
1917.....	100.0	100.0	35.1	8.6	50.2	40.9	10.9	28.1	3.8	22.4
1912.....	100.0	100.0	40.7	11.0	47.8	52.6	11.5	36.3		
1907.....	100.0	100.0	55.2	23.1	37.9	49.5	6.9	27.3		

PRIMARY POWER EQUIPMENT.

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DIAGRAM 5.—CENTRAL ELECTRIC STATIONS—STEAM POWER, BY STATES: 1917, 1912, AND 1907.



It is of little significance at present to study the relative importance of steam power as contrasted with the other kinds of primary power without making a separation of the antiquated steam engine from the newer and more efficient steam turbine which has largely taken its place. Some mention has already been made of the general changes in primary power equipment. It should be noted, however, that practically all of the steam engines in both commercial and municipal stations are to be found in the lowest group, "500 horsepower or under," and the average size of these machines is in both cases well under 200 horsepower. It is further significant to find that the decrease in the number of these small machines has been very marked for commercial plants, from 4,535 in 1907 to 3,253 in 1917, accompanied by a no less marked decrease in horsepower capacity, from 781,673 to 593,538. Municipal plants, on the other hand, report an increase in number in this small group, from 1,648 in 1907 to 1,947 in 1917, with a corresponding increase in horsepower capacity, from 236,893 to 313,419. In the group between 500 and 2,000 there has been some decrease both in number and horsepower of engines reported by commercial stations. In the next group, while there has been a slight decrease in number of units and their capacity since 1912, there has actually been a considerable increase in both since 1907. The highest

group has witnessed very little change and the municipal plants have had at no time any steam engines with a capacity as high as 2,000 horsepower.

The most interesting development in this connection has been the growth in horsepower capacity of steam turbines, though their number is relatively small when compared with the number of steam engines. In both classes of stations these turbines are found to be most numerous in the group between 500 and 2,000 horsepower—598, or 40.2 per cent of the total, for commercial plants, and 106, or 50.2 per cent of the total, for municipal plants. The municipal plants also report the greater part of their steam-turbine capacity, 40.9 per cent of the total, in this group. Commercial stations, on the other hand, have shown a rapid increase in the number and capacity of turbines in the highest grouping, until, in 1917, 76.1 per cent of the total horsepower was furnished by these larger units, which averaged 13,105 horsepower per turbine, as opposed to an average of only 6,318 for steam engines in this group. In the lower groups there is not a wide difference between the average size per unit in commercial and municipal plants. There has been during the last five years a rapid increase in the size of steam turbines directly connected to generators, until at present units of 40,000 to 60,000 horsepower are not uncommon.

Table 37

CLASS OF STATIONS.	STEAM ENGINES AND STEAM TURBINES—PER CENT OF INCREASE ¹ (BASED UPON TABLE 36).									
	Total.		Engines grouped according to horsepower:							
	Number.	Horsepower.	500 horsepower or under.	Over 500 and under 2,000 horsepower.	2,000 and under 5,000 horsepower.	5,000 horsepower and over.	Number.	Horsepower.	Number.	Horsepower.
Total:										
1907-1917.....	3.9	221.6	-11.8	-3.7	59.0	79.6	162.2	184.2	.....	877.2
1912-1917.....	-4.6	70.7	-13.0	-8.7	13.7	21.1	32.0	37.1	124.6	151.3
1907-1912.....	8.9	88.4	1.3	5.5	39.9	48.2	98.6	107.4	.....	283.8
Commercial:										
1907-1917.....	-3.7	235.0	-23.9	-16.7	48.8	68.8	150.0	170.3	.....	866.2
1912-1917.....	-9.2	72.8	-20.7	-16.9	7.9	16.3	29.9	34.1	120.1	148.5
1907-1912.....	6.0	93.8	-4.0	0.2	37.9	45.1	92.5	101.0	.....	283.8
Municipal:										
1907-1917.....	28.4	110.6	21.4	38.9	.....	263.2	1,244.4	.....	.....	.....
1912-1917.....	8.7	46.8	4.7	13.2	.....	79.7	95.8	.....	.....	.....
1907-1912.....	18.1	43.5	16.0	22.6	.....	102.1	586.5	.....	.....	.....
STEAM ENGINES.										
Total:										
1907-1917.....	-15.2	-6.0	-15.9	-11.0	-13.1	-7.3	.....	25.2	.....	-7.0
1912-1917.....	-15.0	-10.2	-15.3	-12.7	-14.8	-11.1	.....	-3.1	.....	2.0
1907-1912.....	-0.2	4.7	-0.8	2.0	2.0	4.3	.....	20.3	.....	-8.9
Commercial:										
1907-1917.....	-26.2	-12.1	-28.3	-24.1	-15.0	-8.2	.....	25.2	.....	-7.0
1912-1917.....	-22.5	-14.5	-23.5	-21.2	-18.3	-13.2	.....	-3.1	.....	2.0
1907-1912.....	-4.7	2.8	-6.2	-3.6	4.0	5.8	.....	20.3	.....	-8.9
Municipal:										
1907-1917.....	18.0	29.9	18.1	32.3	.....	8.9	.....	.....	.....	.....
1912-1917.....	4.1	11.9	3.3	10.0	.....	37.3	.....	.....	.....	.....
1907-1912.....	13.4	16.1	14.8	20.3	.....	-20.6	.....	.....	.....	.....
STEAM TURBINES.										
Total:										
1907-1917.....	350.7	725.5	.....	429.1	270.5	326.8	.....	818.0	.....	1,128.1
1912-1917.....	64.3	120.9	60.9	67.7	47.6	56.2	49.0	53.1	136.2	159.5
1907-1912.....	174.3	273.7	.....	215.4	151.1	173.3	.....	173.1	.....	373.3
Commercial:										
1907-1917.....	327.6	713.7	.....	444.5	284.1	288.1	.....	295.3	.....	1,114.1
1912-1917.....	61.6	119.8	61.0	60.1	41.4	51.0	47.1	50.3	131.3	156.5
1907-1912.....	164.6	270.2	.....	240.0	136.3	157.0	.....	162.9	.....	373.3
Municipal:										
1907-1917.....	.....	1,209.7	.....	385.9	.....	981.8	.....	1,244.4	.....	.....
1912-1917.....	86.7	153.4	.....	96.9	.....	97.0	.....	95.8	.....	.....
1907-1912.....	.....	416.8	.....	146.7	.....	449.2	.....	586.5	.....	.....

¹ A minus sign (-) denotes decrease. Percentages are omitted when base is less than 100.

No doubt the maximum limit in size has, for practical purposes, now been reached, but the displacement of steam engines by steam turbines, which was somewhat delayed by the high costs for electrical equipment prevailing during the past few years, will undoubtedly progress rapidly in the future; and wherever practicable larger primary power units will be installed in place of the smaller in those plants which continue to generate current.

Table 37 shows in a clear way the relative importance of the changes which have taken place in steam-power development. From the percentages here given it appears that the movement away from the use of steam engines has in all cases been much more marked for commercial plants, irrespective of their size, than for municipal plants. This fact suggests that municipalities have in many cases been rather conservative in their investment policy and have used equipment which would have been scrapped by the average company, or have in other instances actually installed the discarded equipment of commercial stations. The rate of increase in number and capacity of steam turbines has been very rapid for both groups of stations, though in most cases somewhat more marked for municipal plants, due to the fact that they had little development of this nature in 1907. Those states reporting the greatest amount of steam-turbine horsepower are Pennsylvania (335,966), New York (898,848), and Illinois (843,978), in the order named. No other states approach these in capacity, though Massachusetts, Ohio, California, and Michigan report between 360,000 and 472,000 steam-turbine horsepower. Those states reporting the greatest steam-engine capacity are New York, Pennsylvania, Illinois, and Ohio, all of which have more than 100,000 horsepower. The states of Pennsylvania, New York, Illinois, Ohio, and Massachusetts report a total of 4,305,425 steam horsepower, equivalent to 51 per cent of the total capacity of steam engines and turbines in the United States.

Internal-combustion engines.—Internal-combustion engines include those which are operated by the combustion of oil or gas. Both natural and artificial gas are used, and sometimes gas will be produced by the electric plant by means of a gas-producer plant for the sole purpose of furnishing fuel to be used in the internal-combustion engine. This type of prime mover has for small plants and for auxiliary service numerous advantages over steam engines or steam turbines, which require a great deal of subsidiary equipment in the form of boilers, condensers, etc., and which, accordingly, take up a good deal of space and necessitate a considerable investment. Hence it is not surprising to find a rapid increase in the number of such machines, though not in horsepower capacity, during the past five years, when the costs of all kinds of equipment were much above the normal level. No doubt some plants installed gas or oil

engines which would in ordinary times have preferred steam turbines. Further, it must be remembered that there has been since 1912 an extremely rapid growth of very small generating stations, in which the internal-combustion engine is the only satisfactory kind of prime mover to use.

Table 38

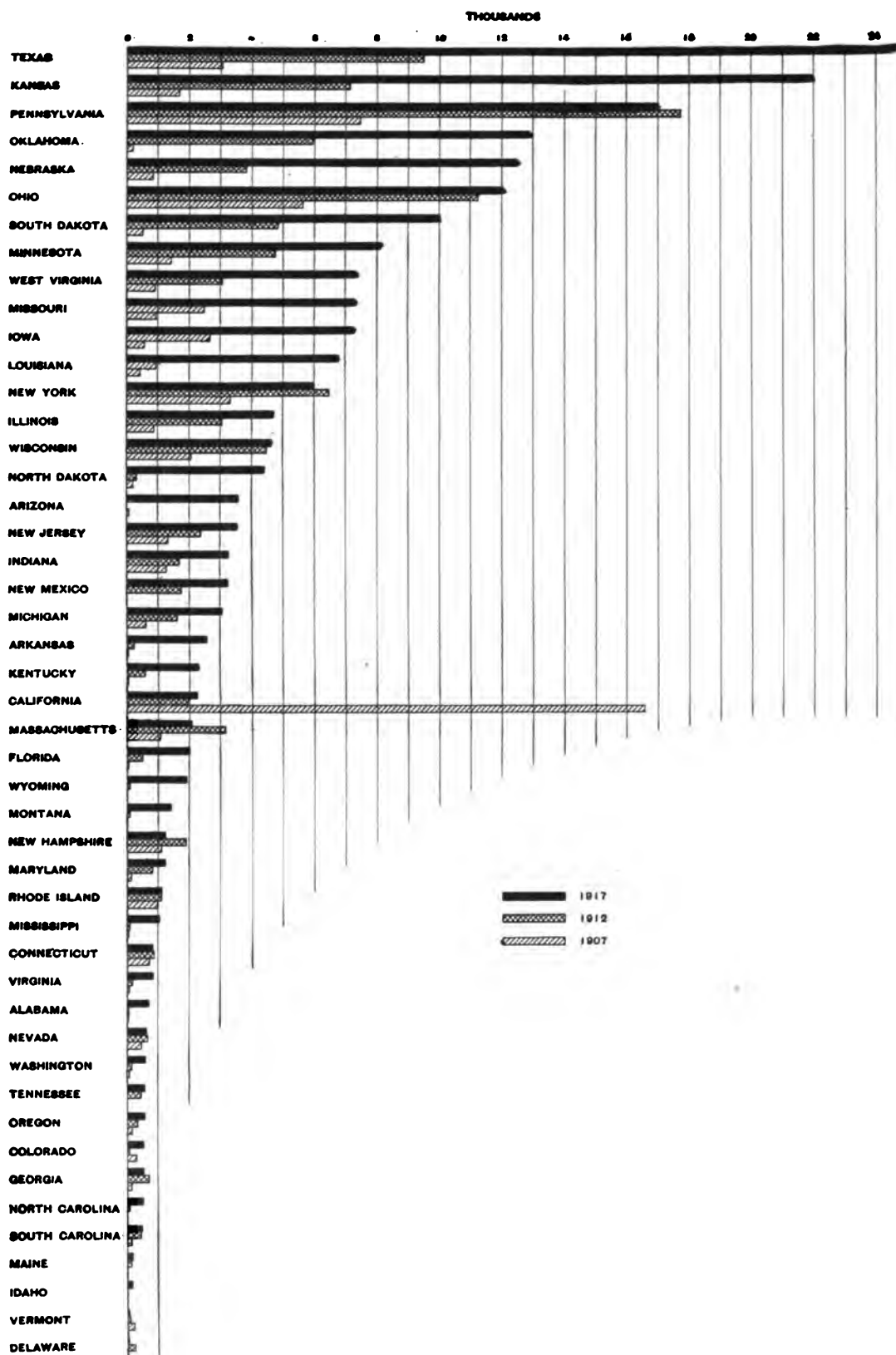
CLASS OF STATIONS.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—INTERNAL-COMBUS- TION ENGINES: 1917, 1912, AND 1907.			
	Internal-combustion engines.		Per cent of total.	
	Number.	Horse- power.	Number.	Horse- power.
Total:				
1917.....	2,934	210,406	100.0	100.0
1912.....	1,116	111,035	100.0	100.0
1907.....	463	55,828	100.0	100.0
Commercial:				
1917.....	1,991	148,574	67.9	70.6
1912.....	833	86,634	74.6	79.8
1907.....	385	49,746	83.2	89.1
Municipal:				
1917.....	943	61,832	32.1	29.4
1912.....	283	22,401	25.4	20.2
1907.....	78	6,082	16.8	10.9
PER CENT OF INCREASE. ¹				
Total:				
1907-1917.....	533.7	276.9		
1912-1917.....	162.9	89.5		
1907-1912.....	141.0	98.9		
Commercial:				
1907-1917.....	417.1	198.7		
1912-1917.....	139.0	67.6		
1907-1912.....	116.4	78.2		
Municipal:				
1907-1917.....		916.6		
1912-1917.....	233.2	176.0		
1907-1912.....		268.3		

¹ Percentages are omitted when base is less than 100.

After what has already been said in other connections regarding the growth in number and importance of internal-combustion engines, it is scarcely necessary to refer in more detail to the subject. Table 38 shows what the development has been, and, since all the machines are very small, no grouping according to horsepower capacity has been possible. It appears, however, that the growth in capacity of these engines has been far more rapid for municipal than for commercial plants (916.6 and 198.7 per cent, respectively) during the decade. In number also the growth for this group has been even more rapid. Compared with the total amount of primary power which is reported by municipal plants, their proportion of gas and oil engines is abnormally high, amounting in 1917 to 32.1 per cent of the number and 29.4 per cent of the horsepower capacity for both commercial and municipal plants, in spite of the fact that the capacity of the latter is only 6.6 per cent of the total. In the matter of size of units, as has already been shown, it appears that there is not much difference between the average for commercial and municipal plants (75 horsepower for the former as opposed to 66 for the latter). In 1917 all states except Utah and the District of Columbia reported internal-combustion engines. Texas led, with a capacity of 24,714 horsepower, followed by Kansas, with a horsepower of 21,965. Pennsylvania, Oklahoma, Nebraska, Ohio, and South Dakota all report internal-combustion engines with a total capacity between 10,000 and 20,000 horsepower.

ELECTRICAL INDUSTRIES: 1917.

DIAGRAM 6.—CENTRAL ELECTRIC STATIONS—INTERNAL-COMBUSTION ENGINES, HORSEPOWER, BY STATES: 1917, 1912, AND 1907.



Water power.—Water wheels and turbines continue to form a very important part of the primary power equipment of central electric stations, though they have not shown the increase in relative importance, as compared with some other types of prime movers, which might have been expected had conditions been normal during the past few years. As has already been pointed out, the initial investment in connection with hydroelectric development is very great, and it is ordinarily necessary to transmit the current produced by means of this motive power long distances over high-tension lines to the centers of industry and population, where electricity is most used. This necessitates further expenditure for overhead construction, in addition to the already high capital outlays for water-power rights, dams, etc., at the place where the generating station is located. All of these expenses are of a sort not ordinarily met

with in the case of steam-power plants. Hence, during a period when the cost of material and labor is abnormally high, it would not be surprising to find a retardation of the growth of hydroelectric development in spite of the fact that, after the initial heavy investment, operating expenses are far lower than in the case of other types of electric plants. The future gains which might be secured by the conservation of fuel and the ultimate reduction of unit costs of current have during the war period been more than counterbalanced by the large capital expenditures necessary in the present in order further to develop this part of the country's natural resources. Accordingly, it is to be expected that during the latter part of the period from 1912 to 1917 there would be merely a fuller utilization of existing hydroelectric plants rather than an installation of new ones or rapid extension of service into more distant districts.

Table 39

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—WATER WHEELS AND TURBINES, BY NUMBER AND HORSE-POWER CAPACITY: 1917, 1912, AND 1907.

CLASS OF STATIONS.	Total.		Machines grouped according to horsepower.							
			500 horsepower or under.		Over 500 and under 2,000 horsepower.		2,000 and under 5,000 horsepower.		5,000 horsepower and over.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
Total:										
1917.....	3,374	4,377,373	2,143	287,956	731	725,522	232	745,662	268	2,418,138
1912.....	2,939	2,469,231	2,002	334,737	637	591,648	147	448,780	153	1,094,086
1907.....	2,481	1,849,087	1,910	320,636	405	357,671	111	330,980	55	339,800
Commercial:										
1917.....	3,109	4,076,878	1,922	350,849	709	707,234	226	730,162	252	2,288,633
1912.....	2,670	2,338,970	1,804	299,616	575	551,308	144	441,960	147	1,046,086
1907.....	2,328	1,818,740	1,761	296,689	408	355,671	109	326,580	55	339,800
Municipal:										
1917.....	265	300,595	221	37,107	22	18,288	6	15,500	16	129,500
1912.....	269	130,261	198	35,121	62	40,340	3	6,800	6	48,000
1907.....	153	30,347	149	23,947	2	2,000	2	4,400		
PER CENT OF INCREASE. ¹										
Total:										
1907-1917.....	36.0	217.0	12.2	21.0	80.5	102.8	109.0	125.3	.....	611.6
1912-1917.....	14.8	73.2	7.0	15.9	14.8	22.6	57.8	66.2	75.2	121.0
1907-1912.....	18.5	83.0	4.8	4.4	57.3	65.4	32.4	35.6	.....	222.0
Commercial:										
1907-1917.....	33.5	209.1	9.1	18.2	75.9	98.8	107.3	123.6	.....	573.5
1912-1917.....	16.4	74.3	6.5	17.1	23.3	28.3	56.9	65.2	71.4	118.8
1907-1912.....	14.7	77.4	2.4	1.0	42.7	55.0	32.1	35.3	.....	207.9
Municipal:										
1907-1917.....	73.2	560.8	48.3	55.0	.....	814.4	.....	262.3	.....	.....
1912-1917.....	-1.5	53.8	11.6	8.6	.....	-54.7	.....	127.9	.....	160.8
1907-1912.....	75.8	329.2	32.9	46.7	.....	1,917.0	.....	54.5	.....	.....
PER CENT DISTRIBUTION.										
Total:										
1917.....	100.0	100.0	63.5	9.1	21.7	17.0	6.9	17.4	7.9	56.5
1912.....	100.0	100.0	68.1	13.6	21.7	24.0	5.0	18.2	5.2	44.3
1907.....	100.0	100.0	77.0	28.8	16.3	26.5	4.5	24.5	2.2	25.2
Commercial:										
1917.....	100.0	100.0	61.8	8.6	22.8	17.3	7.3	17.9	8.1	56.1
1912.....	100.0	100.0	67.6	12.8	21.5	23.6	5.4	18.9	5.5	44.7
1907.....	100.0	100.0	75.6	22.5	17.3	27.0	4.7	24.8	2.4	25.8
Municipal:										
1917.....	100.0	100.0	83.4	18.5	8.3	9.1	2.3	7.7	6.0	64.6
1912.....	100.0	100.0	73.6	27.0	23.0	31.0	1.2	5.2	2.2	36.8
1907.....	100.0	100.0	97.4	78.9	1.4	6.6	1.3	14.5	.....	.....

¹ A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

As will be seen from Table 39, at each of the three censuses the bulk of the hydroelectric power, 95.3, 94.7, and 97.8 per cent, respectively, was reported for

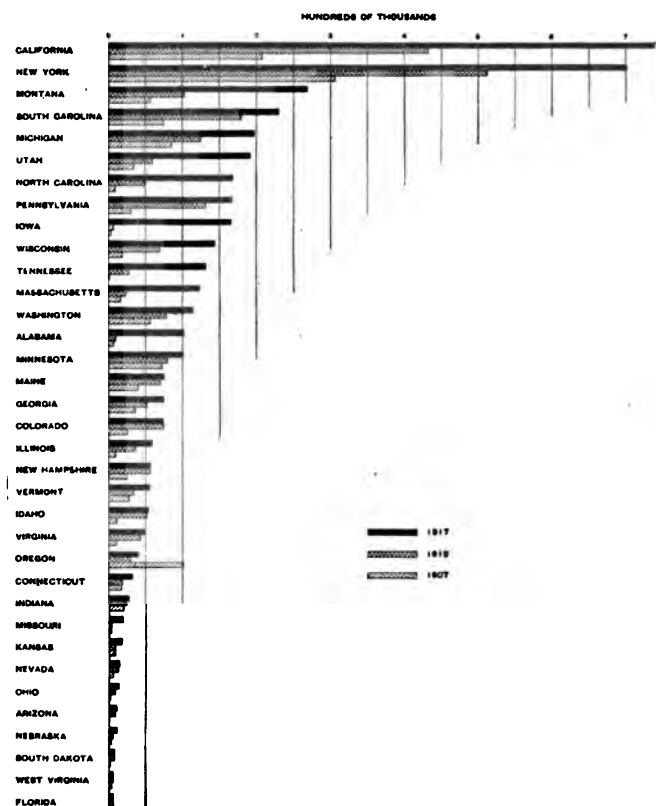
commercial stations. A further examination of the table shows that during the past five years there has been a more rapid increase in horsepower of water

wheels and turbines for commercial than for municipal stations (74.3 per cent as opposed to 53.8 per cent), though for the decade the increase has been much more rapid for municipal plants, which in 1907 used very little of this kind of primary power. In the different groupings according to horsepower capacity it is interesting to find that for both classes of stations those machines of less than 500 horsepower are most numerous, though in the case of commercial plants they rank lowest in total capacity (8.6 per cent), while in municipal plants such units rank second (18.5 per cent). In both classes of stations, also, the largest proportion of horsepower is found in that group of machines having 5,000 horsepower and over. The per cent of increase in horsepower capacity during the decade has for commercial plants been most marked, 573.5 per cent, in the highest group. For both groups, also, during the past five years the most rapid increase in capacity has taken place in those machines having more than 5,000 horsepower. The rate of increase in the capacity of the smallest group of units, while not rapid in either case, was somewhat more marked for commercial plants, 17.1 per cent, as contrasted with 5.6 per cent for municipal plants. It is rather surprising to find that in the group between 500 and 2,000 horsepower municipal plants have shown since 1912 a decrease of 54.7 per cent in capacity, whereas commercial plants report a gain of 28.3 per cent. For those water wheels and turbines having a capacity of 5,000 horsepower or greater the average capacity is 9,023 horsepower as opposed to 12,981 horsepower for steam turbines in the same group.

The statistics for water-power development in connection with central electric light and power stations give rise to certain anomalies which did not occur in the data covering the types of prime movers already discussed. Owing to the fact that some important hydroelectric plants have numerous generating stations frequently widely scattered and even located in different states, though all serving as part of the same distributing system, it is difficult to present absolutely accurate figures as to the number and capacity of water wheels and turbines in the different states. There were, in 1917, 1,079 different stations which reported some water power and 259 which had water wheels and turbines, totaling 1,000 horsepower or more. Many stations, of course, report other types of primary power machines in addition, which are sometimes used only as auxiliaries when water power is insufficient, though in other instances the different types are constantly used. It is to be expected, however, that whenever possible the water power will be used for

generating current in order to save the cost of fuel. Finally, there are 548 plants or stations which use water power only, as shown in Table 35.

DIAGRAM 7.—WATER POWER, BY STATES: 1917, 1912, AND 1907.
[States with less than 5,000 horsepower in 1917 are omitted.]



The map in Chapter III indicates those sections of the country in which large hydroelectric developments are found. So far as the total capacity of water wheels and turbines for the different states is concerned, it appears that California leads, with 738,977 horsepower. This state is closely followed by New York, with 701,948 horsepower; Montana ranks third, with 268,917, and South Carolina fourth, with 230,099. No other states report as much as 200,000 horsepower in water wheels and turbines, though there are 11 which have between 100,000 and 200,000 horsepower—Michigan, Utah, North Carolina, Pennsylvania, Iowa, Wisconsin, Tennessee, Massachusetts, Washington, Alabama, and Minnesota, in the order named. Five states—California, New York, Montana, South Carolina, and Michigan—report a total of 2,138,156 water horsepower, or almost 50 per cent of the total for the United States. In 1912 there were only 6 states reporting more than 100,000 water horsepower, as opposed to 15 in 1917.

CHAPTER V.—GENERATING EQUIPMENT.

Dynamos of central stations and electric railways.—It is significant for the purposes of this census to note the changes which have taken place during the past 10 years in the generating equipment of both central stations and electric railways. Since these two industries, aside from the isolated electric plants earlier referred to, report practically all the electric generating equipment of the country, the figures presented in Table 40 show with a high degree of accuracy the development of the electrical industries in the United

States. There is, it may be observed, a closer connection between the kilowatt capacity of dynamos and the actual services rendered to the public than is the case with primary power equipment, for the latter, particularly in connection with the very large stations of which water-power plants are typical, may be used for purposes other than the generation of electric energy, such as the supplying of mechanical power to near-by concerns or the furnishing of steam used for heating purposes.

Table 40

CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—NUMBER, KIND, AND KILOWATT CAPACITY OF DYNAMOS: 1917, 1912, AND 1907.									
	Number of station having generating equipment.	Total.		Kind of dynamos.					
				Direct current, constant voltage.		Direct current, constant amperage.		Alternating and poly-phase current.	
		Number.	Kilowatt capacity.	Number.	Kilowatt capacity.	Number.	Kilowatt capacity.	Number.	Kilowatt capacity.
Total:									
1917.....	5,590	15,508	11,919,186	4,160	944,970	325	23,753	11,023	10,950,463
1912.....	5,197	15,401	7,670,755	4,968	1,161,213	820	82,162	9,613	6,427,390
1907.....	5,056	15,297	4,432,641	5,872	1,347,962	1,685	80,992	7,740	3,003,687
Central stations:									
1917.....	5,243	13,428	8,994,407	3,195	418,571	308	18,116	9,925	8,557,720
1912.....	4,714	12,610	5,165,439	3,407	432,412	745	43,828	8,458	4,689,199
1907.....	4,487	12,173	2,709,225	3,680	406,460	1,685	80,992	6,808	2,221,773
Electric railways:									
1917.....	347	2,080	2,924,779	965	526,399	17	5,637	1,098	2,392,743
1912.....	483	2,791	2,506,316	1,561	728,801	75	38,324	1,155	1,738,191
1907.....	569	3,124	1,723,416	2,192	941,502	(1)	(1)	932	781,914
PER CENT OF INCREASE. ¹									
Total:									
1907-1917.....	10.6	1.4	168.9	-29.2	-29.9	-80.7	-70.7	42.4	264.6
1912-1917.....	7.6	0.7	55.4	-18.3	-18.6	-80.4	-71.1	14.7	70.4
1907-1912.....	2.8	0.7	73.1	-15.4	-13.9	-51.3	1.4	24.2	114.0
Central stations:									
1907-1917.....	16.8	10.3	232.0	-13.2	3.0	-81.7	-77.6	45.8	285.2
1912-1917.....	11.2	6.5	74.1	-6.2	-3.2	-58.7	-58.7	17.3	82.5
1907-1912.....	5.1	3.6	90.7	-7.4	0.4	-55.8	-45.9	24.2	111.1
Electric railways:									
1907-1917.....	-39.0	-33.4	69.7	-56.0	-44.1			17.8	206.0
1912-1917.....	-28.2	-25.5	16.7	-38.2	-27.8			-4.9	37.7
1907-1912.....	-15.1	-10.7	45.4	-28.8	-22.6			23.9	122.3

¹ Not reported separately.

² A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

From Table 40 it appears that, while the number of electric railways having generating equipment has rapidly decreased during the decade from 569 in 1907 to 347 in 1917, the number of central electric stations of all kinds supplied with dynamos has steadily though slowly increased, the gain being only 16.8 per cent in 10 years. It is further significant to note that, whereas the number of such street railways *decreased* most rapidly between 1912 and 1917 (28.2 per cent), the number of central stations with generating equipment *increased* most rapidly (11.2 per cent) during this same period. At the present time, therefore, the street railways in this group form only 6.2 per cent of the total number of

stations supplied with generating equipment. Further examination shows that the decrease (25.5 per cent) in the number of dynamos for electric railways has been almost as rapid as the decrease in the number of stations equipped with dynamos, whereas there has been a slight increase (6.5 per cent) in the case of the central stations. In kilowatt capacity, however, there has been a marked increase during the decade for both industries, 69.7 per cent for electric railways and 232 per cent for central stations. The increase during the past five years, however, has been very small, 16.7 per cent for electric railways as opposed to an increase of 74.1 per cent for central stations. The total kilowatt

capacity of all dynamos in 1917 was 11,919,186 and the total number was 15,508. From the figures given it is evident that electric railways report 13.4 per cent of the number of all dynamos and 24.5 per cent of their total capacity. Further, the average generating capacity for the street railways is 8,429 kilowatts per station and 1,406 kilowatts per machine as opposed to central station averages of 1,716 and 670, respectively.

It is scarcely worth while at present to make any separate study of the different types of dynamos reported under the heads of "Direct current" and "Alternating current." While in the earlier days direct-current dynamos were commonly used for generating power and for arc lighting, the well-known advantages which alternating current has over direct current in the matter of long-distance transmission and transformation into different voltages, so that it can be adapted to a wide variety of services, have led to a rapidly diminishing use of direct-current machines. It is interesting to find that at present direct-current constant-amperage dynamos are practically nonexistent. The actual number of direct-current generators of all kinds amounts to 26.1 per cent of the total number of dynamos reported by central electric stations and to 47.2 per cent of the total number returned by electric railways. Their kilowatt capacity, however, in both cases forms a negligible part of the total, being for central stations 4.9 per cent of the total capacity and for electric railways 18.2 per cent. The average size of these direct-current generators is 125 kilowatts in the central stations and 542 kilowatts in street railways, whereas the average size of the alternating-current dynamos is for the former 862 kilowatts and for the latter 2,179. Finally, since 1907 the electric railways have been subject to a decrease of 56 per cent in the number and 44.1 per cent in the kilowatt capacity of their direct-current constant-voltage dynamos, whereas for central stations the decrease in number has been only 13.2 per cent, while there has been a slight gain of 3 per cent in the kilowatt capacity, though the latter dropped a little during the past five years.

Dynamos of commercial and municipal stations compared.—Table 41 shows the number of commercial and municipal stations having generating equipment, together with the number and total capacity of all dynamos.

From the figures given in Table 41 it appears that in 1917 the dynamos of municipal plants comprised 25.6 per cent of the total number of all stations (3,437 as opposed to 9,991 reported by commercial stations),

while their capacity amounted to only 6.5 per cent of the total kilowatt capacity for both groups (582,463 for municipal stations as contrasted with 8,411,944 for commercial stations). Further, it is significant that, while there has been practically no increase in the number of dynamos in commercial stations, the increase for municipal plants during the past decade has been 43.5 per cent, and the rate of increase has been more rapid during the last five years (24.2 per cent) than during the early five-year period (15.5 per cent). On the other hand, the increase in kilowatt capacity has been at both periods more marked in the case of the commercial plants, but the difference has been most noticeable since 1912, during which time commercial stations report a growth of 76.4 per cent in dynamo capacity as opposed to only 46.8 per cent reported by the municipal plants.

Table 41

CLASS OF STATIONS.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS.		
	Number of stations having generating equipment.	Total number of dynamos.	Total kilowatt capacity of dynamos.
Total:			
1917.....	5,243	13,428	8,994,407
1912.....	4,714	12,610	5,165,439
1907.....	4,487	12,173	2,709,225
Commercial:			
1917.....	3,417	9,991	8,411,944
1912.....	3,265	9,843	4,768,762
1907.....	(1)	9,778	2,500,209
Municipal:			
1917.....	1,826	3,437	582,463
1912.....	1,449	2,767	396,677
1907.....	(1)	2,395	209,016
PER CENT OF INCREASE.			
Total:			
1907-1917.....	16.8	10.3	232.0
1912-1917.....	11.2	6.5	74.1
1907-1912.....	5.1	8.6	90.7
Commercial:			
1907-1917.....	(1)	2.2	236.4
1912-1917.....	4.7	1.5	76.4
1907-1912.....	(1)	0.7	90.7
Municipal:			
1907-1917.....	(1)	43.5	178.7
1912-1917.....	26.0	24.2	46.8
1907-1912.....	(1)	15.5	59.8

¹ Figures not available.

Though the figures no longer have any vital significance, it may not be amiss to call attention to the fact that in 1917 direct-current generators formed 26.4 per cent of the number of all dynamos reported by commercial plants and 25.2 per cent of the number reported by municipal plants. The relative kilowatt capacity of these dynamos is, respectively, 4.7 and 7.5 per cent of the total capacity reported by each group of plants. In 1912 municipal stations reported 807

direct-current generators having a capacity of 44,564 kilowatts, while commercial stations reported 3,345 with a capacity of 431,676 kilowatts. Five years later, however, the former reported 866 direct-current machines with a capacity of 43,864 kilowatts, while the latter returned 2,637 generators of this type with a total capacity of 392,823. These figures, accordingly, indicate a decrease of 21.2 per cent in the number of direct-current dynamos reported by commercial stations and an increase of 7.3 per cent in the number reported by municipal plants; but each group shows some decrease in the kilowatt capacity, the former 9 per cent and the latter 1.6 per cent. Many plants, of course, reported both alternating and direct current dynamos. There were, however, eight states—New Hampshire, Vermont, Rhode Island, Colorado, New Mexico, Arizona, Utah, and Nevada—in which municipal plants reported no direct-current generators, while in one state—Nevada—no such equipment was found in commercial stations.

In Table 42 is given the average kilowatt capacity of dynamos per station and per machine for the years 1917, 1912, and 1907. The averages per station are based upon the number of stations which reported generating equipment and not upon the total number of stations, many of which in 1912 and 1917 had no generating equipment. For 1907, however, it is now impossible to secure separate figures for commercial and municipal stations which had no equipment; hence for this year the averages for the two groups are based on the total number of stations reported, which was not widely different from the number having generating equipment.¹

AVERAGE KILOWATT CAPACITY.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE KILOWATT CAPACITY OF DYNAMOS PER STATION AND PER MACHINE.								
	Total.			Commercial.			Municipal.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907
Per station.....	1,716	1,096	604	2,462	1,461	1,722	319	274	1,167
Per machine.....	670	410	228	842	484	256	169	143	87
Alternating and poly-phase current.....	862	554	326	1,000	667	384	209	180	113
Direct current.....	125	115	91	149	120	100	51	55	48

¹ Average for 1907 is based on the total number of stations, both with and without generating equipment.

It appears from Table 42 that for all plants the average capacity per station has increased from 604 kilowatts in 1907 to 1,716 kilowatts in 1917, a growth of 184.1 per cent. The average capacity per commercial station practically doubled between 1907 and 1912, while during the next five-year period there was an increase of 63.5 per cent, from 1,461 to 2,462. Municipal plants during this same period experienced

a growth of only 16.4 per cent, from 274 kilowatts in 1912 to 319 in 1917. The average size per machine has also shown a rapid increase during the past 10 years, particularly for commercial stations. In this group the average has increased from 256 to 842, or 228.9 per cent. Municipal plants, however, show a growth of less than 100 per cent, from an average of 87 kilowatts in 1907 to 169 in 1917. Further, it may be observed that alternating-current dynamos show a much higher kilowatt capacity per machine than do the direct-current dynamos. For commercial stations the figures for 1917 were, respectively, 1,090 and 149 kilowatts. The increase in the average capacity of alternating-current dynamos was for commercial plants 63.6 per cent between 1912 and 1917 and only 16.1 per cent for municipal plants. There has been no significant change in the average size of direct-current generators during the period.

The foregoing figures clearly indicate the rapid growth in size of stations and in the installation of the larger and more economically operated generating units for commercial plants during recent years. Municipal stations, on the other hand, have apparently confined themselves to the smaller units and have not been securing many of the gains which seem to come from combinations in the other group.

Dynamos, by geographic divisions and states and by kilowatt capacity.—Table 43 shows the total kilowatt capacity of dynamos for the different geographic divisions and states, the actual and percentage increases since 1907, and the per cent distribution. The Middle Atlantic and East North Central divisions together have at the last three censuses reported approximately 50 per cent of the dynamo capacity returned by all central stations. However, the most rapid rate of increase in dynamo capacity during the past 10 years is found in the East South Central division. In this division also there has been relatively the greatest increase in the percentage distribution of dynamo capacity as compared with the other divisions.

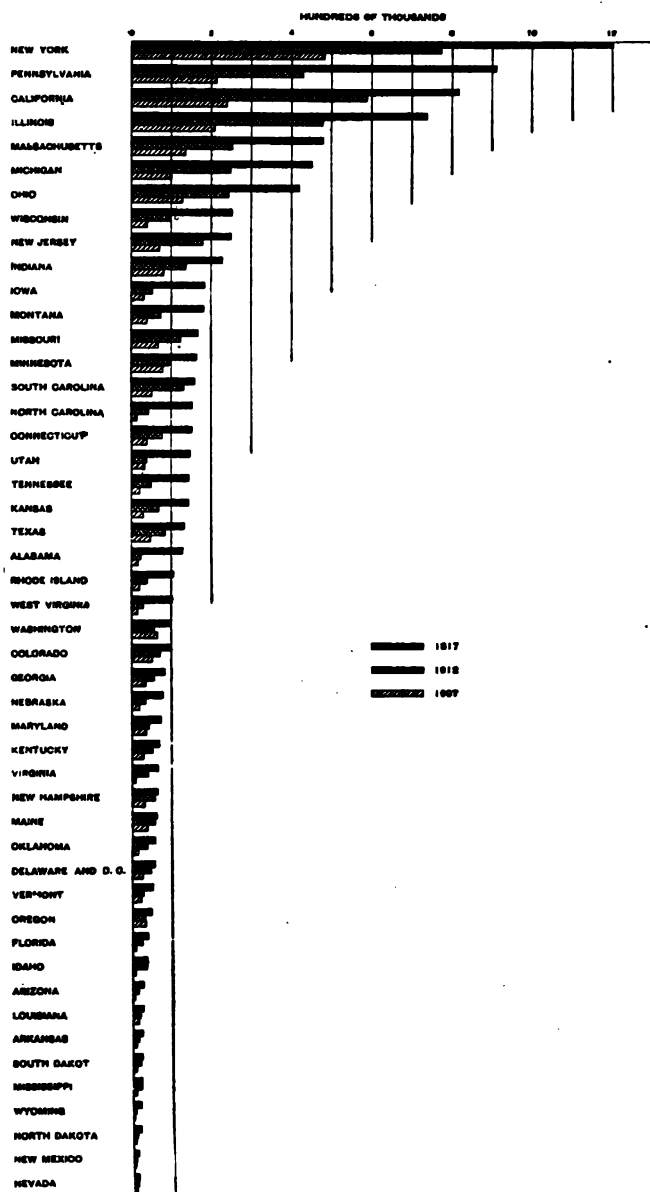
Among the several states, New York has led at all periods, reporting a dynamo capacity of 1,202,804 in 1917. This state was followed by Pennsylvania (910,434 kilowatts), California (817,194), and Illinois (737,621). New York alone reported 13.4 per cent of the total capacity for the United States, and these four states together report 40.8 per cent of the total capacity. There are also three other states which have a large dynamo capacity—Massachusetts (478,933), Michigan (451,276), and Ohio (420,481). Following this group there are three other states—Wisconsin, New Jersey, and Indiana—with a total capacity of somewhat more than 200,000, but no other states report so much as 200,000 kilowatts.

CENTRAL ELECTRIC STATIONS—TOTAL KILOWATT CAPACITY OF DYNAMOS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

Table 43

DIVISION AND STATE.	TOTAL KILOWATT CAPACITY OF DYNAMOS.			Actual increase: 1907-1917	Per cent of increase: 1907-1917	PER CENT DISTRIBUTION.		
	1917	1912	1907			1917	1912	1907
UNITED STATES.....	8,994,407	5,165,439	2,709,225	6,285,182	232.0	100.0	100.0	100.0
GEOGRAPHIC DIVISIONS:								
New England.....	918,152	514,889	289,388	628,764	217.3	10.2	10.0	10.7
Middle Atlantic.....	2,382,759	1,378,811	765,140	1,597,619	208.8	26.3	26.7	28.2
East North Central.....	2,069,849	1,204,528	559,760	1,530,089	273.3	23.2	23.3	20.7
West North Central.....	780,138	404,172	245,252	534,886	218.1	8.7	7.8	9.1
South Atlantic.....	735,619	415,529	195,309	540,310	276.6	8.2	8.0	7.2
East South Central.....	366,532	160,042	77,059	289,473	375.6	4.1	2.9	2.8
West South Central.....	242,375	158,369	88,910	153,465	172.6	2.7	3.1	3.3
Mountain.....	533,997	261,119	151,032	382,965	253.6	5.9	5.1	5.6
Pacific.....	964,986	677,980	337,375	627,611	186.9	10.7	13.1	12.5
NEW ENGLAND:								
Maine.....	63,242	58,757	39,290	23,952	61.0	6.9	11.4	13.6
New Hampshire.....	65,560	57,768	31,917	33,643	105.4	7.1	11.2	11.0
Vermont.....	51,751	29,468	21,854	29,897	136.8	5.6	5.7	7.6
Massachusetts.....	478,933	252,732	135,924	343,009	252.4	52.2	49.1	47.0
Rhode Island.....	106,017	38,509	21,040	84,977	403.9	11.5	7.5	7.3
Connecticut.....	152,649	77,655	39,363	113,286	287.8	16.6	15.1	13.6
MIDDLE ATLANTIC:								
New York.....	1,202,804	772,080	482,031	720,773	149.5	50.9	56.0	63.0
New Jersey.....	249,521	179,477	70,566	178,965	253.6	10.6	13.0	9.2
Pennsylvania.....	910,434	427,304	212,543	697,891	328.4	38.5	31.0	27.8
EAST NORTH CENTRAL:								
Ohio.....	420,481	244,182	126,533	293,948	232.3	20.1	20.3	22.6
Indiana.....	227,825	135,801	81,576	146,249	179.3	10.9	11.3	14.6
Illinois.....	787,621	477,917	209,226	528,395	252.5	35.3	39.7	37.4
Michigan.....	451,276	247,789	101,714	349,562	343.7	21.6	20.6	18.2
Wisconsin.....	252,646	96,839	40,711	211,935	520.6	12.1	8.2	7.3
WEST NORTH CENTRAL:								
Minnesota.....	162,854	93,502	78,516	84,338	107.4	20.9	23.1	32.0
Iowa.....	184,506	53,237	32,056	152,450	475.6	23.6	13.2	13.1
Missouri.....	166,813	122,786	68,467	98,346	143.6	21.4	30.4	27.9
North Dakota.....	20,041	10,824	5,819	14,222	244.4	2.6	2.7	2.4
South Dakota.....	24,323	20,032	10,046	14,277	142.1	3.1	5.0	4.1
Nebraska.....	78,227	34,586	20,041	58,186	290.3	10.0	8.6	8.2
Kansas.....	143,374	66,205	30,307	113,067	373.1	18.4	17.1	12.4
SOUTH ATLANTIC:								
Delaware, District of Columbia, and Maryland.....	131,288	89,887	62,956	68,332	108.5	17.8	21.6	32.2
Virginia.....	65,913	40,512	9,195	56,718	616.8	9.0	9.7	4.7
West Virginia.....	103,611	29,772	14,726	88,885	603.6	14.1	7.2	7.5
North Carolina.....	153,410	43,099	13,911	139,499	1,002.8	20.9	10.4	7.1
South Carolina.....	159,255	132,408	51,271	107,984	210.6	21.6	31.9	26.3
Georgia.....	84,330	56,232	35,446	48,884	137.9	11.5	13.5	18.1
Florida.....	37,812	23,619	7,804	30,008	384.5	5.1	5.7	4.0
EAST SOUTH CENTRAL:								
Kentucky.....	69,442	54,062	29,140	40,302	138.3	18.9	36.0	37.8
Tennessee.....	145,335	49,640	20,911	124,424	595.0	39.7	33.1	27.1
Alabama.....	128,509	24,477	17,124	111,385	650.5	35.1	16.3	22.2
Mississippi.....	23,246	21,863	9,884	13,362	135.2	6.3	14.6	12.8
WEST SOUTH CENTRAL:								
Arkansas.....	24,913	16,335	9,678	15,235	157.4	10.3	10.3	10.9
Louisiana.....	25,762	19,169	15,175	10,587	69.8	10.6	12.1	17.1
Oklahoma.....	57,783	38,301	15,499	42,284	272.8	23.8	24.2	17.4
Texas.....	133,917	84,564	48,558	85,359	175.8	55.3	53.4	54.6
MOUNTAIN:								
Montana.....	182,079	74,398	39,602	142,477	359.8	34.1	28.5	26.2
Idaho.....	37,103	35,656	7,082	30,021	423.9	6.9	13.7	4.7
Wyoming.....	20,627	8,212	3,208	17,419	543.0	3.9	8.1	2.1
Colorado.....	94,791	71,668	53,130	41,661	78.4	17.8	27.4	25.2
New Mexico.....	12,713	7,981	3,789	8,924	236.5	2.4	3.1	2.5
Arizona.....	26,972	14,756	4,939	22,033	446.1	5.0	8.7	3.3
Utah.....	147,359	37,935	33,592	113,767	338.7	27.6	14.5	22.2
Nevada.....	12,353	10,513	5,690	6,663	117.1	2.3	4.0	3.8
PACIFIC:								
Washington.....	99,875	57,283	66,308	33,567	50.6	10.3	8.4	19.7
Oregon.....	47,917	32,416	32,587	15,330	47.0	5.0	4.8	9.7
California.....	817,194	588,281	238,480	578,714	242.7	84.7	86.8	70.7

DIAGRAM 8.—KILOWATT CAPACITY OF DYNAMOS, BY STATES:
1917, 1912, AND 1907.



The actual increases in dynamo capacity during the decade have been greatest in New York (720,773), Pennsylvania (697,891), California (578,714), and Illinois (528,395). During the past five years also the most marked increases have taken place in Pennsylvania (483,130) and in New York (430,774), while four other states—Illinois, California, Massachusetts, and Michigan—show increases ranging between 200,000 and 260,000 kilowatts. The most rapid rate of increase during the decade, as well as during the past five years, was found in North Carolina and in Alabama.

In Table 44 (p. 68) are shown the number and

kilowatt capacity of central electric stations, grouped according to their total kilowatt capacity, both for the United States and for the various geographic divisions, for 1917, 1912, and 1907.

It is significant to find that while the total number of stations supplied with generating equipment has increased only 16.8 per cent during the decade, from 4,487 in 1907 to 5,243 in 1917, the number having no generating equipment has increased during the same period from 227 to 1,299, or 472.2 per cent. So far as the United States totals are concerned, it appears that the *number* of stations having a capacity under 200 kilowatts has been at all times most numerous, though the total *capacity* of this group has always been very low. There has not, however, been any marked difference in the aggregate kilowatt capacity of stations in the three lowest groups. There has been since 1907 a slight increase in the number of stations in the lowest group (10.2 per cent), but there has been a corresponding decrease in the kilowatt capacity (10 per cent). During the past five years there has been a slight decrease in the number of stations with a capacity between 200 and 500 kilowatts as well as in the number of those grouped between 500 and 1,000 kilowatts. During the same time the total capacity of these groups has remained practically stationary. The only marked increase both in number and in kilowatt capacity has been in the group reporting 5,000 kilowatts or more. In this group the kilowatt capacity has doubled during the last five years and quintupled during the decade. An examination of the different geographic divisions discloses the fact that, while in most cases there has been a decrease in the number and kilowatt capacity of the smaller groups of stations, the West North Central, South Atlantic, and West South Central divisions have shown a marked increase for the decade in the number of stations reporting less than 200 kilowatts, 71.2, 54, and 43.7 per cent, respectively. In the next group also the West North Central division shows a 65 per cent increase in the number of stations and 70 per cent increase in total capacity. These figures indicate the rapid growth of small generating stations, largely under individual, firm, or municipal ownership, in the divisions mentioned. The rate of increase in the total kilowatt capacity of the highest group of stations since 1907 has been greatest (2,528.2 per cent) in the East South Central division, which in 1907 reported only 1 station with a capacity of 11,100 kilowatts. This division is followed in rate of increase by the West South Central (852.2 per cent), the New England (584 per cent), the East North Central (569.9 per cent), and the Mountain (497.8 per cent).

ELECTRICAL INDUSTRIES: 1917.

CENTRAL ELECTRIC STATIONS—NUMBER, BY DYNAMO CAPACITY AND BY GEOGRAPHIC DIVISIONS: 1917, 1912, AND 1907.

Table 44			STATIONS GROUPED ACCORDING TO DYNAMO CAPACITY.															
DIVISION ¹ AND CENSUS YEAR.			NUMBER OF STATIONS.		Total.		Under 200 kilowatts.		200 and under 500 kilowatts.		500 and under 1,000 kilowatts.		1,000 and under 2,000 kilowatts.		2,000 and under 5,000 kilowatts.		5,000 kilowatts and over.	
			Total.	Having no generating equipment.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.
UNITED STATES:																		
1917.....			6,542	1,299	5,243	8,994,407	3,348	236,216	899	272,224	335	226,987	242	336,699	182	577,120	237	7,345,177
1912.....			5,221	507	4,714	5,165,439	2,902	250,571	948	278,505	337	228,885	214	301,495	152	404,993	161	8,640,990
1907.....			4,714	227	4,487	2,709,225	3,038	262,601	821	246,015	269	182,664	169	228,313	115	356,821	75	1,432,811
Per cent of increase ² —																		
1907-1917.....			38.8	472.2	16.8	232.0	10.2	-10.0	9.5	10.6	24.5	24.3	43.2	47.5	58.3	61.7	.....	412.6
1912-1917.....			25.3	156.2	11.2	74.1	15.4	-5.7	-5.2	-2.3	-0.6	-0.8	13.1	11.7	19.7	24.1	47.2	101.7
1907-1912.....			10.8	123.3	5.0	90.7	-4.5	-4.6	15.5	13.2	25.3	25.3	26.6	32.1	32.2	30.3	.....	154.1
NEW ENGLAND.																		
1917.....			383	128	255	918,152	82	7,146	44	13,965	31	20,734	39	52,071	26	98,688	33	725,528
1912.....			368	77	291	514,889	102	9,609	64	20,300	39	27,255	36	50,260	26	79,047	24	328,418
1907.....			365	87	328	289,388	147	13,780	74	24,544	41	27,867	35	50,415	22	66,725	9	106,077
Per cent of increase ² —																		
1907-1917.....			4.9	.....	-22.3	217.3	-44.2	-48.1	.....	-43.0	.....	-25.6	.....	3.3	.....	47.9	.....	584.0
1912-1917.....			4.1	.....	-12.4	78.3	-19.6	-25.6	.....	-31.1	.....	-23.9	.....	3.6	.....	24.8	.....	120.9
1907-1912.....			0.8	.....	-11.3	77.9	-30.6	-30.2	.....	-17.3	.....	-2.2	.....	-0.3	.....	18.5	.....	208.6
MIDDLE ATLANTIC:																		
1917.....			679	179	500	2,362,759	191	17,692	126	37,932	52	34,398	43	58,500	31	93,947	57	2,120,290
1912.....			669	99	570	1,378,811	249	23,823	144	43,851	66	46,037	43	61,815	36	108,018	32	1,095,267
1907.....			705	62	643	765,140	334	31,928	150	46,459	72	50,424	41	52,574	28	82,889	18	500,866
Per cent of increase ² —																		
1907-1917.....			-3.7	.....	-22.2	208.8	-42.8	-44.6	-16.0	-18.4	.....	-31.8	.....	11.3	.....	13.3	.....	323.3
1912-1917.....			1.5	.....	-12.3	71.4	-23.3	-25.7	-12.5	-13.5	.....	-25.3	.....	-5.4	.....	-13.0	.....	93.6
1907-1912.....			-5.1	.....	-11.4	80.2	-25.4	-25.4	-4.0	-5.6	.....	-8.7	.....	17.6	.....	30.3	.....	118.7
EAST NORTH CENTRAL:																		
1917.....			1,385	304	1,081	2,089,849	660	50,470	208	63,872	73	49,778	56	79,705	35	115,448	49	1,730,581
1912.....			1,260	106	1,154	1,204,528	723	64,843	241	70,782	76	50,290	54	75,376	30	96,947	30	846,290
1907.....			1,295	21	1,274	559,760	906	79,935	229	66,357	70	47,633	34	41,158	22	66,334	13	258,343
Per cent of increase ² —																		
1907-1917.....			6.9	.....	-15.2	273.3	-27.2	-36.9	-9.2	-3.8	.....	4.5	.....	93.6	.....	74.0	.....	569.9
1912-1917.....			9.9	186.8	-6.3	73.5	-8.7	-22.2	-13.7	-9.8	.....	-1.0	.....	5.7	.....	19.1	.....	104.5
1907-1912.....			-2.7	.....	-9.4	115.2	-20.2	-18.9	5.2	6.7	.....	5.6	.....	83.1	.....	46.1	.....	227.6
WEST NORTH CENTRAL:																		
1917.....			1,730	324	1,406	780,138	1,063	64,744	193	58,359	62	42,867	43	62,689	26	80,413	19	471,066
1912.....			1,077	57	1,020	404,172	760	60,340	166	47,739	54	36,761	16	23,532	12	36,515	12	199,285
1907.....			800	12	788	245,252	621	51,556	117	34,327	25	15,714	13	17,798	5	15,420	7	110,437
Per cent of increase ² —																		
1907-1917.....			116.2	.....	78.4	218.1	71.2	25.6	65.0	70.0	.....	172.8	.....	252.2	.....	421.5	.....	326.5
1912-1917.....			60.6	.....	37.8	93.0	39.9	7.3	16.3	22.2	.....	16.6	.....	166.4	.....	120.2	.....	136.4
1907-1912.....			34.6	.....	29.4	64.8	22.4	17.0	41.9	39.1	.....	133.9	.....	32.2	.....	136.8	.....	80.5
SOUTH ATLANTIC:																		
1917.....			728	143	585	735,619	385	27,452	108	32,067	33	23,186	13	16,990	23	68,802	23	567,122
1912.....			512	54	458	415,529	278	24,825	107	31,313	28	18,953	17	22,394	13	35,747	15	282,297
1907.....			390	14	376	195,309	250	22,180	90	26,663	11	7,655	10	13,758	8	21,634	7	103,419
Per cent of increase ² —																		
1907-1917.....			86.7	.....	55.6	276.6	54.0	22.9	.....	20.3	.....	202.9	.....	23.5	.....	218.0	.....	448.4
1912-1917.....			42.2	.....	27.7	77.0	38.5	10.6	0.9	2.4	.....	22.3	.....	-24.1	.....	92.5	.....	100.9
1907-1912.....			31.3	.....	21.8	112.8	11.2	11.9	.....	17.4	.....	147.6	.....	62.8	.....	65.2	.....	173.0
EAST SOUTH CENTRAL:																		
1917.....			410	24	386	366,532	291	18,792	59	17,999	10	7,135	11	16,003	5	14,875	10	291,728
1912.....			330	8	322	150,042	216	18,522	69	19,499	15	10,900	8	11,384	6	17,712	8	72,025
1907.....			284	2	282	77,059	219	19,394	46	13,285	7	4,961	3	4,795	6	23,524	1	11,100
Per cent of increase ² —																		
1907-1917.....			44.4	.....	36.9	375.6	32.9	-3.1	.....	35.5	.....	43.8	.....	233.7	.....	-36.8	.....	2,528.2
1912-1917.....			24.2	.....	19.9	144.3	34.7	1.4	.....	-7.7	.....	-34.6	.....	40.6	.....	-16.0	.....	305.0
1907-1912.....			16.2	.....	14.2	94.7	-1.4	-4.5	.....	46.8	.....	119.7	.....	137.4	.....	-24.7	.....	548.9
WEST SOUTH CENTRAL:																		
1917.....			636	43	593	242,375	447	33,799	82	23,958	27	18,084	16	23,755	12	42,847	9	99,982
1912.....			507	9	498	158,399	362	30,697	87	23,769	24	15,175	11	16,007	9	30,172	5	42,549
1907.....			365	3	362	88,910	311	23,625	52	15,187	13	8,866	8	12,125	6	18,608	2	10,500
Per cent of increase ² —																		
1907-1917.....			61.0	.....	51.3	172.6	43.7	43.1	.....	57.8	.....	103.4	.....	96.9	.....	130.3	.....	852.2
1912-1917.....			25.4	.....	19.1	53.0	23.5	10.1	.....	0.8	.....	18.8	.....	48.4	.....	42.0	.....	135.0
1907-1912.....			28.4	.....	27.0	78.1	16.4	29.9	.....	56.5	.....	71.2	.....	32.0	.....	62.1	.....	305.2
MOUNTAIN:																		
1917.....			337	70	267	533,997	143	10,336	54	16,216	34	22,420	13	16,751	10	26,172	13	442,102
1912.....			250	34	216	261,119	107	9,791	44	13,674	24	14,996	18	25,556	8	21,200	15	175,902
1907.....			219	23	196	151,032	119	9,975	32	9,931	20	13,302	9	12,807	10	31,067	6	73,960
Per cent of increase ² —																		
1907-1917.....			53.9	.....	36.2	253.6	20.2	3.6	.....	63.3	.....	68.5	.....	30.8	.....	-15.8	.....	497.8
1912-1917.....			34.8	.....	23.6	104.5	33.6	5.6	.....	18.6	.....	49.5	.....	-34.5	.....	23.4	.....	151.3
1907-1912.....			14.2	.....	10.2	72.9	-10.1	-1.8	.....	37.7	.....	12.7	.....	99.5	.....	-31.8	.....	137.9
PACIFIC:																		
1917.....			254	84	170	964,986	86	5,785	25	7,836	13	8,435	8	10,225	14	35,933	24	896,772
1912.....			248	63	185	677,980	1											

¹ See p. 18 for states composing the several geographic divisions.² A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

Perhaps a tabular view of the percentage distribution of generating stations according to kilowatt capacity reported will best show the relative importance of the different groups. From Table 45, accordingly, it appears that the number of stations reporting less than 200 kilowatts forms at present 63.9 per cent of all generating stations, but this group reports only 2.6 per cent of the kilowatt capacity. There have not been marked changes in the relative

number of stations in most groups, except in that reporting more than 5,000 kilowatts. Stations of this size formed only 1.7 per cent of the total in 1907 and 4.5 per cent in 1917. In total kilowatt capacity, however, there has been a rapid decrease in relative importance for every group except the highest, which has increased from 52.9 per cent in 1907 to 81.7 per cent in 1917.

Table 45

	Census year.	PERCENTAGE DISTRIBUTION OF GENERATING STATIONS, ACCORDING TO KILOWATT CAPACITY OF DYNAMOS AND AVERAGE KILOWATT CAPACITY PER STATION: 1917, 1912, AND 1907.											
		Under 200 kilowatts.		200 and under 500 kilowatts.		500 and under 1,000 kilowatts.		1,000 and under 2,000 kilowatts.		2,000 and under 5,000 kilowatts.		5,000 kilowatts and over.	
		Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.	Number of stations.	Kilowatt capacity.
Per cent of total stations with generating equipment.....	1917	63.9	2.6	17.1	3.0	6.4	2.5	4.6	3.7	3.5	6.4	4.5	81.7
	1912	61.6	4.9	20.1	5.4	7.1	4.4	4.5	5.8	3.2	9.0	3.4	70.5
	1907	67.7	9.7	18.3	9.1	6.0	6.7	3.8	8.4	2.6	13.2	1.7	52.9
Average station capacity.....	1917		71		303		678		1,391		3,171		30,992
	1912		86		294		679		1,409		3,069		22,615
	1907		86		300		679		1,351		3,103		19,104

It is interesting to note the average capacity of stations grouped according to size. As has already been pointed out, the average capacity per generating station increased from 604 kilowatts in 1907 to 1,716 in 1917. The average capacity of those numerous stations in the lowest group was in 1917 only 71 kilowatts, a decrease of 15 since 1912. This is almost unbelievably low; yet 63.9 per cent of all generating stations in the United States were of this average size. In the next four groups there has been practically no change in the average during the past 10 years. In the highest group, however, the increase in size has been very marked, particularly between 1912 and 1917, when the increase from 22,615 to 30,992 kilowatts amounted to 37 per cent. Finally, the average capacity per station in this group is highest (37,366 kilowatts) in the Pacific division. Next in order come the Middle Atlantic (37,198), the East North Central (35,318), and the Mountain (34,008). The division reporting the lowest average capacity of stations in this group is the West South Central, with only 11,109 kilowatts. The others range between 20,000 and 30,000 kilowatts.

Dynamos classified according to motive power used.—In the present census an attempt was made to secure the number and total capacity of dynamos operated solely by water wheels or turbines as contrasted with the number and capacity of those operated by other kinds of primary power. While it was in some instances practically impossible for stations to make a proper classification on this basis, due to the fact that the same dynamo would be operated at certain times during the year by water power and at other times, when the water power was low, perhaps by steam, the figures can not be taken as absolutely

accurate, but they do indicate with reasonable clearness the extent to which water power is used in the generation of electric current. It should be noted that many water-power plants have a primary horsepower somewhat in excess of that which is needed for the operation of their dynamos, due to the fact that they have anticipated future developments in the electrical industry or because they are engaged in furnishing mechanical power to other concerns. Hence it is to be expected that the proportion of the total dynamo capacity reported as operated by water power will be somewhat less than the proportion which the primary water power returned bears to the total primary horsepower of all kinds.

The relative number and capacity of dynamos operated by water power, together with their average capacity, are compared in Table 46 with the data for generators operated by other kinds of power.

Table 46

	CENTRAL ELECTRIC STATIONS—DYNAMOS CLASSIFIED ACCORDING TO PRIMARY POWER USED IN OPERATING: 1917.					
	Operated by water power.		Operated by other power.		Average size.	
	Number.	Kilowatt capacity.	Number.	Kilowatt capacity.	Operated by water power.	Operated by other power.
Total.....	2,877	2,785,897	10,551	6,208,510	968	588
Commercial.....	2,646	2,661,820	7,345	5,750,124	1,006	783
Municipal.....	231	124,077	3,206	458,386	537	143
PER CENT DISTRIBUTION.						
Total.....	21.4	31.0	78.6	69.0	.....	.....
Commercial.....	26.5	31.6	73.5	68.4	.....	.....
Municipal.....	6.7	21.3	93.3	78.7	.....	.....

It is found from Table 46 that for all stations 2,877 machines having a capacity of 2,785,897 kilowatt hours were operated by water power. These units form 21.4 per cent of the total in number and 31 per cent in kilowatt capacity. In average size, however, it appears that this group of dynamos is 64.6 per cent larger (968 kilowatts) than the average for those operated by other power (588 kilowatts). It is further interesting to find that commercial stations reported 26.5 per cent of their total number of dynamos and 31.6 per cent of their capacity as operated by water power, whereas the dynamos so operated by municipal plants comprised only 6.7 per cent of the total number which they reported and 21.3 per cent of the capacity. Finally, the average size of dynamos operated by water power is for commercial plants 1,006 kilowatts, or 28.5 per cent greater than the average size of machines operated by other power. Municipal plants, on the other hand, report an average size of 537 kilowatts, which is 275.5 per cent larger than the average for units operated by other sources of power. In this connection it should be recalled that the proportion which the horsepower of water wheels and turbines bears to the total primary power reported in either case is for commercial stations 33.8 per cent and for municipal plants 23.3 per cent.

Generating equipment not in use.—Before leaving this subject attention should be called to the fact that most large stations have a certain amount of reserve generating equipment which is not necessarily used much of the time. It frequently happens that antiquated equipment will accordingly be retained for use in cases of emergency resulting from breakdown, etc. Naturally, it is impossible to know what proportion of total dynamo capacity is represented by such machines. Data are available, however, in the case of those plants which, while having generating equipment, did not utilize it during the year. In 1917 there were 119 of these—70 commercial and 49 municipal. In 1912 there were 45 commercial stations and 23 municipal stations which did not use their generating equipment but purchased all current sold. The total dynamo capacity reported by such stations in 1917 was 50,984 kilowatts, an average of 428 kilowatts per station as opposed to the average for all generating stations of 1,716 kilowatts, which is about four times as great. That these stations were relatively unimportant is further indicated by the fact that, while they comprised 1.8 per cent of all stations in the United States, their output, which was entirely pur-

chased current (177,983,122 kilowatt hours), was less than six-tenths of 1 per cent of the total output, both generated and purchased, for all stations. It is not surprising to find a slight growth in the relative number of such plants since 1912 (from 1.3 per cent to 1.8 per cent of the total), due to the fact that many have found it more economical to purchase current than to continue generation when the price of fuel is so high. It should further be remembered that many plants which have once generated current, upon ceasing to do so frequently sell their equipment. Hence the figures here given indicate only in the vaguest sort of way the number of plants which have ceased to generate current. Finally, it should also be noted that all of those plants which during the year generate any current, no matter how little, are included as generating stations. Many of these, however, had a large amount of equipment which was idle practically all of the time and which may eventually be discarded altogether.

Stations without generating equipment.—Those central stations which purchase all of their current comprise not only the relatively small number which have generating equipment not in use, but also the much larger group having no generating equipment whatever. These in turn were in some cases formerly generating stations which have now disposed of their equipment, though in a majority of instances they were no doubt originally constructed merely as purchasing plants. Whatever may have been their ancient history, the number of stations without generating equipment has increased with great rapidity, both absolutely and relatively, between the different census periods, and particularly since 1912. In 1902 there were 78 such stations, or 2.2 per cent of the total number. The figures had increased by 1907 to 227, or 4.8 per cent of the total, a growth of 191 per cent. By 1912 there had been a further increase to 507, or 123.3 per cent, equal to 9.7 per cent of all stations. In 1917 the number of stations without generating equipment reported was 1,299, or 19.9 per cent of the total. This was a growth of 156.2 per cent during the five-year period and an absolute increase of 792.

An examination of Table 47 shows that the number of municipal plants without generating equipment increased at a more rapid rate (335.4 per cent) than did commercial plants (104.8 per cent). While there were 113 of the former without generating equipment in 1912 and 492 in 1917, there were 394 and 807 corresponding commercial plants reported at the same

dates. For commercial and municipal stations combined the number of plants in this group is highest in the West North Central division (324) and in the East North Central division (304), while the lowest number is to be found in the East South Central (24) and the West South Central (43). Relative to the total number of stations reported in the various divisions, the number having no generating equipment is highest in the New England division (33.4 per cent), followed by the Pacific division (33.1 per cent), the Middle Atlantic (26.4 per cent), and the East North Central (21.9 per cent). It is further interesting to find that commercial stations report the highest number without generating equipment (187) in the East North Central division. This is followed by the Middle Atlantic (155) and the West North Central (137). Municipal plants, on the other hand, show the highest figures in the West North Central (187), followed by the East North Central (117). The relatively highest number of such plants was reported by commercial stations in the New England division, where they comprised about 30 per cent of the total number of commercial stations in the division, followed by the Middle Atlantic division, with nearly 28 per cent, whereas municipal plants show the highest proportion, almost 48 per cent, in the Pacific division, closely followed by the New England division, with about 46 per cent.

Table 47

TOTAL NUMBER OF COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS, AND NUMBER HAVING NO GENERATING EQUIPMENT, BY GEOGRAPHIC DIVISIONS.

DIVISION ¹ AND CENSUS YEAR.	Total.				Number of stations.			
	All stations.		No generating equipment.		Commercial.		Municipal.	
	Num-ber.	Per cent distri-bution.	Num-ber.	Per cent of total.	Total.	No gener-ating equip-ment.	Total.	No gener-ating equip-ment.
United States:								
1917.....	8,542	100.0	1,299	19.9	4,224	807	2,318	492
1912.....	8,221	100.0	507	9.7	3,659	394	1,562	113
New England:								
1917.....	888	5.8	128	33.4	311	95	72	33
1912.....	368	7.0	77	20.9	311	61	57	16
Middle Atlantic:								
1917.....	679	10.4	179	26.4	556	155	123	24
1912.....	669	12.8	99	14.8	567	92	102	7
East North Central:								
1917.....	1,385	21.2	304	21.9	818	187	567	117
1912.....	1,260	24.1	106	8.4	786	82	474	24
West North Central:								
1917.....	1,730	26.4	324	18.7	970	137	760	187
1912.....	1,077	20.6	57	5.3	678	37	399	20
South Atlantic:								
1917.....	728	11.1	143	19.6	398	72	330	71
1912.....	512	9.8	54	10.5	308	31	204	23
East South Central:								
1917.....	410	6.3	24	5.9	256	17	154	7
1912.....	330	6.3	8	2.4	202	6	128	2
West South Central:								
1917.....	636	9.7	43	6.8	445	32	191	11
1912.....	507	9.7	9	1.8	385	7	122	2
Mountain:								
1917.....	337	5.2	70	20.8	264	51	73	19
1912.....	280	4.8	34	13.6	211	28	39	6
Pacific:								
1917.....	284	3.9	84	33.1	206	61	48	23
1912.....	248	4.8	63	25.4	211	50	37	13

¹ See p. 18 for states composing the several geographic divisions.

CHAPTER VI.—OUTPUT AND DISPOSAL OF CURRENT.

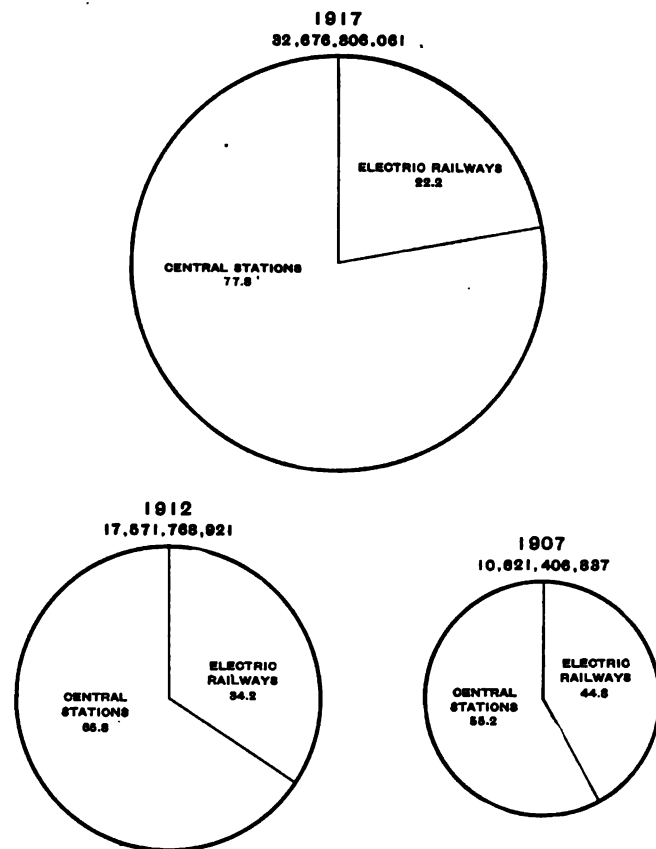
Kilowatt hours generated.—While it is interesting to know the amount of generating capacity which is possessed by the central stations and electric railways of the United States, the extent to which that capacity is used is far more significant. Hence, careful attention must be given to the number of kilowatt hours generated by the different groups of stations. Accordingly, Table 48 shows for electric railways and for central stations, classified according to commercial and municipal ownership, the amount of current generated for the three census periods 1917, 1912, and 1907, with percentages of increase for the decade and for the two five-year periods.

Table 48	CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—KILOWATT HOURS GENERATED.		
	1917	1912	1907
Total.....	32,678,806,061	17,571,768,921	10,621,406,837
Central stations.....	25,438,303,272	11,569,109,885	5,862,276,737
Commercial.....	24,398,983,183	11,031,583,155	5,572,813,949
Municipal.....	1,039,320,089	537,526,730	289,462,788
Electric railways.....	7,240,502,789	6,002,659,036	4,759,130,100
PER CENT OF TOTAL.			
Central stations.....	77.8	65.8	55.2
Commercial.....	74.6	62.7	52.5
Municipal.....	3.2	3.1	2.7
Electric railways.....	22.2	34.2	44.8
PER CENT OF INCREASE.			
	1907-1917	1912-1917	1907-1912
Total.....	207.7	86.0	65.4
Central stations.....	333.9	119.9	97.3
Commercial.....	337.8	121.2	98.0
Municipal.....	259.1	93.4	85.7
Electric railways.....	52.1	20.6	26.1

Earlier figures were to a large extent merely estimates, as many stations did not before 1907 measure their current either at the switchboard or when delivered to customers. This suggestion, of course, applies more specifically to central stations than to street railways. In 1907, also, no distinction was made between current generated and current purchased, and consequently there was some duplication in the figures for that date, though at the time comparatively little current was sold to other companies. Finally, mention should be made of the fact that even in 1917 a large number of the smaller central stations did not make any attempt to measure the quantity of current produced, so that the figures which they have returned are merely their best estimates, based on the extent and nature of their business. It

is felt, however, that as a result of the extended correspondence and careful checking in connection with this inquiry on the schedule, the figures here presented, relating to the output and disposal of current for 1917, are as nearly correct as human effort could make them in the limited time available.

DIAGRAM 9.—KILOWATT HOURS GENERATED: 1917 1912, AND 1907.



It is significant to find that the total number of kilowatt hours generated by central stations and electric railways has more than trebled since 1907, until in 1917 the figures stand at 32,678,806,061 kilowatt hours. The increase, both for the decade and during the past five years, was far more marked in the case of electric light and power plants than in the case of street railways. The former show a gain of 333.9 per cent since 1907, or nearly 20,000,000,000 kilowatt hours. The latter during the same period increased their current generated by only 52.1 per cent, or about 2,500,000,000 kilowatt hours. Between 1912 and 1917 electric street railways experienced a much smaller increase than that shown for central stations, 20.6 per cent for the former as opposed to 119.9 per cent for the latter. At all periods, also, the growth in current produced has been markedly

more rapid for commercial than for municipal plants. A study of the per cent of the total which was at the different periods generated by the respective groups shows that electric railways were in 1917 relatively only half so important as in 1907. At the former date they generated only 22.2 per cent of all current, whereas in 1907 they produced 44.8 per cent. For central stations, on the other hand, commercial plants have shown an equally marked growth in the importance of their generation of current, which increased from 52.5 per cent of the total in 1907 to 74.6 per cent in 1917. Municipal plants have done little more than maintain their status quo in relation to the other groups. They generated 2.7 per cent of all current in 1907, 3.1 per cent in 1912, and 3.2 per cent in 1917. As compared with the total output of central stations only, however, municipal plants have been subject to a decrease in relative amount of current generated, from 4.9 per cent in 1907 to 4.6 per cent in 1912, and 4.1 per cent in 1917.

It is of interest to the student of the problem to study the changes which have taken place in the nature of the business done by central electric stations in recent years. As is well understood, a comparatively high initial investment in plant and equipment of various kinds is needed in order to make it possible to generate current at all. Once this investment is made, however, the aim of the management should be to keep the dynamos in use to full capacity for as many hours per day as possible. In other words, it is necessary to see that the capital invested is constantly earning the highest possible return on itself. Consequently, when the lighting business of a central station has been built up, every effort is or should be made to secure a profitable power or heating business, etc., which will enable the dynamos to be kept busy during the daytime when otherwise the load on the station would be negligible. Accordingly, the larger and more progressive plants frequently find it highly desirable to make unusually low rates to those customers who wish to be served during the day at "off peak" times, for the only appreciable additional expense to which they are put in furnishing current under these circumstances is the mere cost of the extra fuel which may be required at the generating station. All the overhead expenses go on just the same, and even a considerable quantity of fuel is needed in the case of steam plants to bank fires under the boilers at times when the station load is light.

By comparing the amount of current actually generated by the different groups of plants during the year with the amount which they could theoretically have produced had the dynamos been in use to their full capacity for 24 hours per day and 365 days per year, it is possible to see the changes which have taken place in the character of the business carried on by central stations even though the actual output

of current for the different services might not be known. Table 49 shows the number of hours' use of maximum generating capacity both for electric railways and central stations in 1912 and 1917. No satisfactory data could be computed for 1907, owing to the fact, as previously stated, that purchased current was included with current generated when the returns were made, and also because of the fact that a very considerable amount of current generated was not measured at the earlier date.

Table 49

	NUMBER OF HOURS' USE OF MAXIMUM GENERATING CAPACITY: 1917 AND 1912.				
	1917	1912	Percent of increase.	Percent of possible use.	
				1917	1912
Central stations.....	7.75	6.14	26.2	32.3	25.6
Commercial.....	7.95	6.34	25.4	33.1	26.4
Municipal.....	4.89	3.71	31.8	20.4	15.5
Electric railways.....	6.78	6.56	3.4	28.3	27.3

Electric railways seem to have made little change in the nature of their business in spite of the fact that they sell an appreciable amount of current for power other than car lines (1,788,913,277 kilowatt hours in 1917). While their dynamos reported were in use to maximum capacity for 6.56 hours per day in 1912, the number of hours' use per day had increased to 6.78 in 1917, or 3.4 per cent. Central stations, on the other hand, report an increase from 6.14 hours' use of maximum capacity to 7.75, a gain of 26.2 per cent during the five-year period. Commercial stations have not experienced so rapid a growth in this respect as have municipal plants (25.4 per cent as opposed to 31.8 per cent), but this is no doubt largely occasioned by the fact that in 1912 the former had already developed many lines of service in addition to electric lighting, while the latter then confined themselves almost solely to this one form of activity. In spite of the per cent of increase during the last five years, the actual discrepancy between the two was greater in 1917 than in 1912. At the earlier date commercial stations used their maximum capacity on an average of 6.34 hours per day, or 2.63 more hours than did the municipal plants. In 1917, on the other hand, their generators were busy almost a third of the time, 7.95 hours per day as opposed to only 4.89 hours for municipal plants. The difference, 3.06 hours, shows that commercial stations were operating to fullest capacity for 62.6 per cent more time than were the other group.

Table 50, which shows, by geographic divisions and states, the number of kilowatt hours generated by all central electric stations in the United States in 1917, 1912, and 1907, will no doubt be of interest to the various localities concerned. During the decade, as well as during the past five years, the actual increase

ELECTRICAL INDUSTRIES: 1917.

in amount of current produced was greatest for the Middle Atlantic division, and the absolute increase has been particularly marked since 1912—from 3,548,605,305 kilowatt hours in the last-named year to 7,659,317,763 in 1917. This division is followed at

both periods in actual increase by the East North Central. The per cent of increase during the decade, however, has been most rapid, 784.1 per cent, in the East South Central division, followed by the South Atlantic with 555 per cent.

CENTRAL ELECTRIC STATIONS—OUTPUT OF GENERATING STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

Table 50

DIVISION AND STATE.	KILOWATT HOURS GENERATED.				
	1917	1912	1907	Actual increase: ¹ 1907-1917	Per cent of increase: ¹ 1907-1917
UNITED STATES.....	25,438,308,272	11,569,109,885	5,862,276,737	19,576,026,535	333.9
GEOGRAPHIC DIVISIONS:					
New England.....	1,835,584,072	865,379,442	473,802,067	1,361,782,005	287.4
Middle Atlantic.....	7,659,317,763	3,548,605,305	2,009,304,180	5,650,013,603	281.2
East North Central.....	5,757,150,135	2,527,964,097	1,075,933,354	4,681,216,781	435.1
West North Central.....	1,776,475,523	712,595,442	386,180,647	1,390,294,876	360.0
South Atlantic.....	1,745,295,143	729,896,397	266,437,175	1,478,857,968	555.0
East South Central.....	1,048,814,771	227,664,808	118,631,967	930,182,804	784.1
West South Central.....	482,645,862	233,947,656	138,755,643	343,890,219	247.8
Mountain.....	2,036,194,737	845,393,882	381,032,187	1,655,162,550	434.4
Pacific.....	3,096,825,266	1,877,662,856	1,012,199,537	2,084,625,729	206.0
NEW ENGLAND:					
Maine.....	165,504,379	117,092,565	66,136,651	99,367,728	150.2
New Hampshire.....	180,456,223	126,593,970	55,258,921	105,197,302	190.4
Vermont.....	65,079,504	42,659,884	29,923,333	35,156,171	117.5
Massachusetts.....	937,124,653	386,254,294	219,425,607	717,699,046	327.1
Rhode Island.....	161,866,170	62,106,528	35,661,323	126,204,847	354.0
Connecticut.....	345,563,143	130,672,201	67,406,232	278,156,911	412.6
MIDDLE ATLANTIC:					
New York.....	3,828,592,181	2,175,048,634	1,452,222,471	2,376,369,710	163.6
New Jersey.....	781,230,790	383,891,504	140,527,522	640,703,268	455.9
Pennsylvania.....	3,049,494,792	989,665,167	416,554,167	2,632,940,625	632.1
EAST NORTH CENTRAL:					
Ohio.....	1,083,514,202	399,101,309	217,311,924	866,202,278	398.6
Indiana.....	441,423,585	286,944,000	130,263,663	311,159,862	238.9
Illinois.....	2,210,372,750	1,150,900,306	467,637,328	1,742,735,422	372.6
Michigan.....	1,504,239,843	525,615,508	206,154,196	1,298,085,644	623.6
Wisconsin.....	517,599,955	215,402,974	82,546,210	435,053,745	525.0
WEST NORTH CENTRAL:					
Minnesota.....	440,632,508	186,045,055	87,579,431	353,053,077	403.5
Iowa.....	614,808,584	87,186,647	37,726,072	577,079,512	1,529.5
Missouri.....	268,431,159	232,828,763	147,328,446	119,102,713	80.8
North Dakota.....	22,978,006	12,298,553	8,229,765	14,748,241	179.2
South Dakota.....	31,810,487	24,703,754	13,615,015	18,195,472	133.6
Nebraska.....	129,631,131	56,299,682	31,958,789	97,672,392	305.3
Kansas.....	269,963,648	133,252,988	59,740,179	210,243,469	351.9
SOUTH ATLANTIC:					
Delaware.....	3,359,280	3,412,319	4,714,074	-1,354,794	-28.7
Maryland ²	182,407,826	23,620,117	47,868,675	134,539,151	281.1
District of Columbia.....	140,672,647	90,993,421	25,829,448	114,843,199	444.6
Virginia.....	107,580,758	28,724,684	10,208,360	97,372,398	953.8
West Virginia.....	204,107,945	42,344,796	24,871,317	179,236,628	720.6
North Carolina.....	371,711,733	70,552,737	13,171,681	358,540,052	2,722.1
South Carolina.....	500,430,903	256,771,757	68,696,424	431,734,479	628.5
Georgia.....	184,136,069	87,571,815	59,311,202	124,824,857	210.4
Florida.....	50,887,992	26,895,751	11,765,994	39,121,998	332.5
EAST SOUTH CENTRAL:					
Kentucky.....	122,690,433	75,593,179	37,232,623	85,397,810	229.4
Tennessee.....	564,914,272	75,544,893	34,847,956	530,066,316	1,521.1
Alabama.....	330,771,965	48,602,553	30,846,764	299,925,201	972.8
Mississippi.....	30,498,101	27,924,183	15,704,624	14,793,477	94.2
WEST SOUTH CENTRAL:					
Arkansas.....	38,644,801	17,786,660	11,519,316	27,125,485	235.5
Louisiana ³	26,009,144	18,328,080	26,421,316	-412,172	-1.6
Oklahoma.....	100,737,632	48,824,097	24,985,903	75,751,729	303.2
Texas.....	317,254,285	149,008,819	75,829,108	241,425,177	318.4
MOUNTAIN:					
Montana.....	965,453,777	379,212,617	137,379,261	828,074,516	602.8
Idaho.....	145,307,596	115,812,292	9,577,588	135,730,008	1,417.2
Wyoming.....	27,391,551	11,580,567	5,499,084	21,892,467	398.1
Colorado.....	274,223,978	166,196,068	123,275,212	150,948,766	122.4
New Mexico.....	17,244,768	9,027,824	4,614,349	12,630,419	273.7
Arizona.....	65,731,753	32,960,064	9,392,302	56,339,451	599.8
Utah.....	496,995,136	86,634,658	61,672,661	435,322,475	689.6
Nevada.....	53,846,178	44,969,772	29,621,730	24,224,448	81.8
PACIFIC:					
Washington ⁴	242,370,956	71,414,473	257,785,236	-15,414,280	-6.0
Oregon.....	107,886,973	58,789,342	92,807,962	15,078,981	16.2
California.....	2,746,567,337	1,747,459,041	661,606,309	2,084,961,028	315.1

¹ A minus sign (-) denotes decrease.

² The decrease from 1907 to 1912 is due to the fact that one of the largest companies in Maryland, which generated the current used in 1907, purchased from outside the state most of that used in 1912.

³ The decrease from 1907 to 1912 is due to the fact that companies which were included among the central stations in 1907 have since that date been taken over by the railways and included with them in the report for the electric railway industry in 1912.

Among the individual states, it may further be noted, the most rapid rate of growth (2,722.1 per cent) is to be found in North Carolina, which had

very little electric service in 1907; in Iowa (1,529.5 per cent), in Tennessee (1,521.1 per cent), and in Idaho (1,417.2 per cent). The greatest actual in-

OUTPUT AND DISPOSAL OF CURRENT.

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creases have, to be sure, taken place in the more important industrial states, of which Pennsylvania heads the list for the decade, with 2,632,940,625 kilowatt hours. New York is a close second, with 2,376,369,710 kilowatt hours. These are followed by California (2,084,961,028), Illinois (1,742,715,422), and Michigan (1,296,085,644). No others show a gain as high as 1,000,000,000 kilowatt hours. During the

period 1912 to 1917 the greatest actual growth is found in Pennsylvania, where it amounts to more than 2,000,000,000 kilowatt hours. Then come New York, Illinois, California, and Michigan, the first of which shows an increase of nearly one and two-thirds billions and the second a little more than 1,000,000,000, while the other two report increases close to 1,000,000,000.

COMMERCIAL CENTRAL ELECTRIC STATIONS—OUTPUT OF GENERATING STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

DIVISION AND STATE.	KILOWATT HOURS GENERATED.				
	1917	1912	1907	Actual increase: ¹ 1907-1917	Per cent of increase: ¹ 1907-1917
UNITED STATES.....	24,398,983,183	11,081,583,155	5,572,813,949	18,826,169,234	337.8
GEOGRAPHIC DIVISIONS:					
New England.....	1,776,289,676	826,143,047	450,908,003	1,325,381,673	298.9
Middle Atlantic.....	7,618,232,163	3,518,216,083	1,988,341,586	5,630,890,577	284.1
East North Central.....	5,846,781,569	2,280,324,043	960,308,248	4,886,473,321	467.0
West North Central.....	1,623,567,900	650,887,721	342,800,564	1,280,767,336	373.6
South Atlantic.....	1,069,198,197	680,571,054	296,136,778	1,433,061,419	606.9
East South Central.....	1,012,378,561	196,969,862	97,074,576	915,303,985	942.9
West South Central.....	441,084,042	211,060,496	125,947,058	315,136,984	250.7
Mountain.....	2,017,305,528	886,580,489	375,515,364	1,641,790,164	436.8
Pacific.....	2,891,595,547	1,880,820,270	1,000,496,774	1,891,108,773	189.0
NEW ENGLAND:					
Maine.....	162,980,638	115,034,805	64,200,146	98,780,492	153.8
New Hampshire.....	159,967,565	126,129,170	54,455,809	105,513,756	198.8
Vermont.....	58,472,064	38,742,885	26,180,943	32,311,211	123.5
Massachusetts.....	863,867,242	358,563,754	206,383,440	657,483,802	333.1
Rhode Island.....	161,856,170	61,961,961	35,506,323	126,350,847	355.9
Connecticut.....	339,206,017	126,690,472	64,196,442	275,009,575	428.4
MIDDLE ATLANTIC:					
New York.....	3,809,608,046	2,160,064,465	1,441,817,340	2,368,790,706	164.3
New Jersey.....	776,066,559	381,674,327	139,357,377	636,709,182	456.9
Pennsylvania.....	3,022,537,558	977,477,291	402,666,899	2,620,870,659	653.1
EAST NORTH CENTRAL:					
Ohio.....	977,013,080	359,821,051	188,017,835	788,995,245	419.6
Indiana.....	381,527,002	205,722,726	106,317,599	275,209,403	258.9
Illinois.....	2,057,481,869	1,047,008,985	429,685,765	1,617,796,104	367.9
Michigan.....	1,432,636,224	461,111,350	178,698,930	1,253,937,304	701.7
Wisconsin.....	500,063,394	206,664,831	47,588,119	452,475,265	950.8
WEST NORTH CENTRAL:					
Minnesota.....	414,943,238	170,965,436	75,441,141	339,502,142	350.0
Iowa.....	593,887,643	57,191,263	30,387,174	563,500,469	1,854.4
Missouri.....	241,267,502	219,381,412	135,838,680	105,428,822	77.6
North Dakota.....	21,081,058	10,766,533	7,210,255	13,870,803	162.4
South Dakota.....	27,832,178	23,537,072	17,584,601	10,247,577	121.2
Nebraska.....	108,214,890	47,765,962	28,286,376	79,948,514	282.8
Kansas.....	216,341,346	121,240,053	58,066,247	168,275,099	307.7
SOUTH ATLANTIC:					
Delaware.....	2,475,900	2,255,400	3,539,139	-1,063,239	-20.0
Maryland.....	176,422,138	20,575,129	45,558,955	130,863,183	287.2
District of Columbia.....	140,672,647	99,903,421	25,829,448	114,843,199	444.6
Virginia.....	95,651,186	20,584,230	7,799,819	87,851,367	1,126.3
West Virginia.....	202,280,794	40,905,654	23,157,102	179,123,692	773.4
North Carolina.....	358,027,715	63,898,266	8,086,074	349,941,641	4,327.7
South Carolina.....	495,531,481	253,704,032	66,654,585	428,876,896	643.4
Georgia.....	170,388,011	75,270,055	51,152,893	119,235,118	233.1
Florida.....	27,768,325	12,404,867	4,358,763	23,409,562	537.1
EAST SOUTH CENTRAL:					
Kentucky.....	112,274,252	65,882,463	33,113,858	79,160,394	239.1
Tennessee.....	552,841,201	65,773,123	27,493,009	525,348,192	1,910.8
Alabama.....	326,525,108	43,320,030	27,908,886	298,616,222	1,070.0
Mississippi.....	20,738,000	21,024,346	8,558,823	12,179,177	142.3
WEST SOUTH CENTRAL:					
Arkansas.....	32,784,841	13,791,366	9,240,827	23,544,014	254.8
Louisiana.....	15,313,868	13,851,237	22,433,161	-7,119,293	-31.7
Oklahoma.....	86,984,421	42,590,541	23,057,560	63,926,861	277.2
Texas.....	306,610,912	140,817,352	71,215,508	235,395,404	330.5
MOUNTAIN:					
Montana.....	962,621,539	377,172,532	137,066,081	825,555,458	602.3
Idaho.....	142,290,046	114,882,022	9,030,453	133,259,593	1,475.7
Wyoming.....	26,897,243	11,483,667	5,499,084	21,398,159	389.1
Colorado.....	271,013,524	163,856,226	122,766,944	148,246,580	120.8
New Mexico.....	15,891,972	8,513,344	4,614,349	11,277,623	244.4
Arizona.....	65,630,864	32,960,084	9,392,302	55,238,562	568.8
Utah.....	479,114,162	82,773,822	57,824,411	421,289,751	728.6
Nevada.....	53,846,178	44,969,772	29,621,730	24,224,448	81.8
PACIFIC:					
Washington.....	118,883,821	37,107,773	250,685,581	-131,801,760	-52.6
Oregon.....	101,502,249	55,194,216	92,035,297	9,466,952	10.3
California.....	2,671,209,477	1,738,618,281	657,765,896	2,013,443,581	308.1

¹ A minus sign (-) denotes decrease.

² The decrease from 1907 to 1912 is due to the fact that one of the largest companies in Maryland, which generated the current used in 1907, purchased from outside the state most of that used in 1912.

³ The decrease from 1907 to 1912 is due to the fact that companies which were included among the central stations in 1907 have since that date been taken over by the railways and included with them in the report for the electric railway industry in 1912.

The apparent decrease in output between different periods, together with certain discrepancies which occur in connection with the states of Delaware, Maryland, Louisiana, Washington, and Oregon, are usually accounted for by the fact that some companies which reported separately at earlier dates have for later periods been combined with electric railways in such a manner as to preclude the securing of a separate report satisfactory for census purposes. In some

cases, also, it happens that a given station which formerly generated a considerable quantity of current now purchases a portion or all of its output from a plant located in another state. Accordingly, while for any of these reasons there would be a decrease or a less rapid rate of increase in the number of kilowatt hours reported as generated, it should, of course, be understood that there has been an actual increase in the amount of electric current used per capita.

MUNICIPAL CENTRAL ELECTRIC STATIONS—OUTPUT OF GENERATING STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

Table 52 DIVISION AND STATE.	KILOWATT HOURS GENERATED.				
	1917	1912	1907	Actual increase: ¹ 1907-1917	Per cent of increase: ¹ 1907-1917
UNITED STATES.....	1,039,320,089	537,526,730	289,462,788	749,857,301	259.1
GEOGRAPHIC DIVISIONS:					
New England.....	59,294,396	39,236,305	22,899,064	36,395,332	158.9
Middle Atlantic.....	41,085,600	29,389,222	25,962,574	15,123,026	58.3
East North Central.....	408,428,566	247,640,054	115,625,106	292,803,460	253.2
West North Central.....	152,907,623	61,727,711	43,380,083	109,527,540	252.5
South Atlantic.....	76,096,946	49,325,343	30,300,367	45,796,549	151.1
East South Central.....	36,436,210	31,664,846	21,557,391	14,978,819	69.0
West South Central.....	40,951,820	22,897,160	12,808,587	28,143,233	219.7
Mountain.....	18,889,209	8,803,413	5,216,823	13,672,386	262.1
Pacific.....	205,229,719	46,842,586	11,712,763	193,516,956	1,652.2
NEW ENGLAND:					
Maine.....	2,573,741	2,057,760	1,936,505	637,236	32.9
New Hampshire.....	488,668	464,800	805,112	-316,444	-39.2
Vermont.....	6,607,450	3,916,999	3,762,490	2,844,960	75.6
Massachusetts.....	43,267,411	27,690,540	13,042,167	30,225,244	231.8
Rhode Island.....	(1)	114,567	146,000	-146,000	.....
Connecticut.....	6,357,126	4,991,729	3,206,790	3,150,336	98.2
MIDDLE ATLANTIC:					
New York.....	18,984,135	14,984,169	10,905,131	8,079,004	74.1
New Jersey.....	5,144,231	2,217,177	1,170,145	3,974,086	339.6
Pennsylvania.....	16,957,234	12,187,876	13,887,298	3,069,936	22.1
EAST NORTH CENTRAL:					
Ohio.....	106,501,122	39,280,258	29,294,089	77,207,033	263.6
Indiana.....	59,896,383	31,221,274	23,946,094	35,950,289	150.1
Illinois.....	152,890,881	103,896,321	27,971,563	124,919,318	446.6
Michigan.....	71,603,609	64,504,158	29,455,289	42,148,340	143.1
Wisconsin.....	17,536,671	8,738,043	4,958,091	12,578,490	253.7
WEST NORTH CENTRAL:					
Minnesota.....	25,989,225	15,059,619	12,138,290	13,850,935	114.1
Iowa.....	20,920,941	9,975,384	7,341,898	13,579,043	185.0
Missouri.....	25,163,657	13,447,351	11,489,766	13,673,891	119.0
North Dakota.....	1,896,948	1,532,020	1,019,510	877,438	86.1
South Dakota.....	3,978,309	1,166,682	1,030,324	2,947,985	286.1
Nebraska.....	21,316,241	8,533,720	3,689,363	17,626,878	477.8
Kansas.....	53,642,302	12,012,935	6,670,932	46,971,370	704.1
SOUTH ATLANTIC:					
Delaware.....	883,380	1,156,919	1,174,935	-291,555	-24.8
Maryland.....	5,985,688	3,053,988	2,309,720	3,675,968	159.2
District of Columbia.....					
Virginia.....	11,929,572	8,160,454	2,406,541	9,521,031	395.3
West Virginia.....	1,847,151	1,439,142	1,714,215	132,636	7.8
North Carolina.....	13,684,018	6,654,471	5,085,607	8,598,411	169.1
South Carolina.....	4,899,422	3,067,725	2,041,839	2,857,583	140.0
Georgia.....	13,748,048	12,301,760	8,158,309	5,589,739	68.5
Florida.....	23,119,667	13,490,884	7,407,231	15,712,436	212.1
EAST SOUTH CENTRAL:					
Kentucky.....	10,356,181	9,710,716	4,118,765	6,237,416	151.4
Tennessee.....	12,073,071	9,771,770	7,354,947	4,718,124	64.1
Alabama.....	4,246,857	5,282,523	2,937,878	1,308,979	44.6
Mississippi.....	9,760,101	6,899,837	7,145,801	2,614,300	38.6
WEST SOUTH CENTRAL:					
Arkansas.....	5,859,960	3,995,294	2,278,489	3,581,471	157.2
Louisiana.....	10,695,276	4,476,843	3,988,155	6,707,121	168.2
Oklahoma.....	13,753,211	6,233,556	1,928,343	11,824,868	613.2
Texas.....	10,643,373	8,191,467	4,613,600	6,029,773	130.7
MOUNTAIN:					
Montana.....	2,832,238	2,040,065	313,170	2,519,068	804.4
Idaho.....	3,017,550	930,270	547,135	2,470,415	451.5
Wyoming.....	494,308	116,600	.....	494,308	.....
Colorado.....	3,210,454	1,340,842	508,268	2,702,186	531.6
New Mexico.....	1,352,796	514,480	.....	1,352,796	.....
Arizona.....	100,889	.....	.....	100,889	.....
Utah.....	7,880,974	3,860,836	3,848,250	4,032,724	104.8
Nevada.....	.....	.....	.....	.....	.....
PACIFIC:					
Washington.....	123,487,135	34,306,700	7,099,655	116,387,480	1,639.3
Oregon.....	6,384,724	3,595,126	772,695	5,612,029	726.3
California.....	75,357,860	8,940,760	3,840,413	71,517,447	1,862.2

¹ A minus sign (—) denotes decrease.

² None reported in 1917.

DIAGRAM 10.—KILOWATT HOURS GENERATED, BY GEOGRAPHIC DIVISIONS: 1917, 1912, AND 1907.

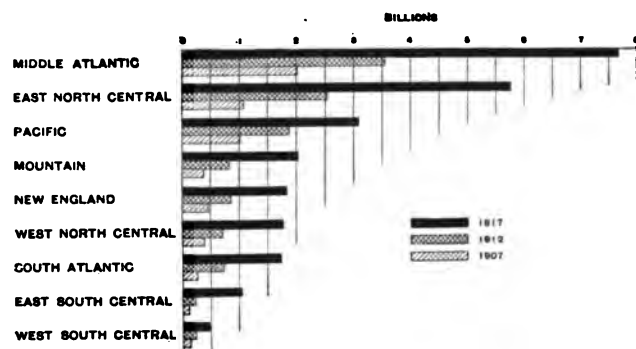
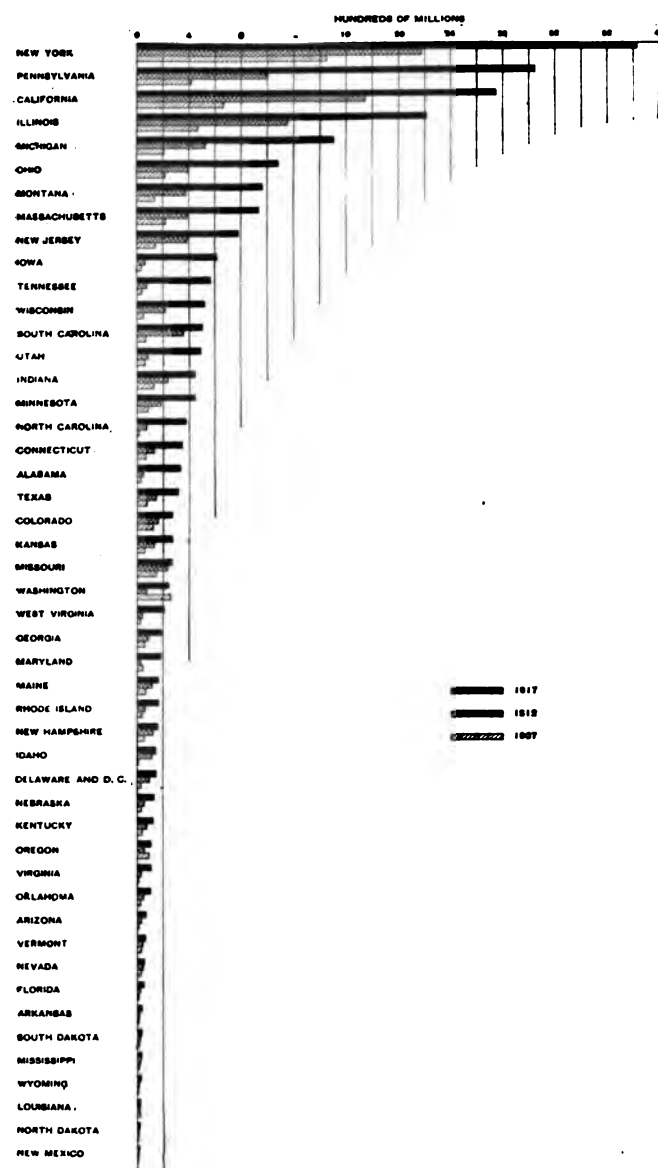


DIAGRAM 11.—KILOWATT HOURS GENERATED, BY STATES: 1917, 1912, AND 1907.



Since the number of kilowatt hours generated by commercial stations was so far in excess of that produced by municipal plants, no separate mention of the data for this group seems to be necessary, as practically all the statements which have been made regarding the combined output for all plants in the United States are also true for commercial plants. It may not, however, be amiss to call attention to some of the figures in connection with municipal plants. The East North Central division reported 408,428,566 kilowatt hours, or almost 40 per cent of the total number of kilowatt hours generated by all municipal plants, and this division has also shown the greatest actual increase since 1907 (292,803,460). The Pacific division was next in importance, with 205,229,719 kilowatt hours generated, followed by the West North Central, in which municipal plants generated 152,907,623 kilowatt hours. The increase during the past five years in actual amount of current generated by municipal plants in the East North Central and the Pacific divisions has been about the same, practically 160,000,000 kilowatt hours, no other division showing any particularly marked changes during the five-year period except the West North Central, in which municipal plants generated about 90,000,000 more kilowatt hours in 1917 than in 1912. The greatest relative increase during the decade is to be found in the Pacific division (1,652.2 per cent). Upon examining the various states it is found that Illinois in 1917 led in number of kilowatt hours generated by municipal plants (152,890,881). In Washington and Ohio, also, the number of kilowatt hours generated by this group was more than 100,000,000 (123,487,135 and 106,501,122, respectively). California (75,357,860), Michigan (71,603,609), Indiana (59,896,383), Kansas (53,642,302), and Massachusetts (43,267,411) complete the list of states in which any considerable quantity of current was generated by municipal plants.

Purchased current.—As the number of large generating stations has increased, and as it is becoming an easier matter to transmit current long distances over high-tension lines, there has normally been an increasing tendency for small plants to discard their generating equipment and purchase current from the larger and more economically operated stations. Many new stations also are now being installed of which the sole function is to distribute to customers the current produced by others. In this respect there is usually a decided gain when water power is used in place of fuel. Theoretically, it would be from the economic point of view highly desirable to have a comparatively few large generating stations which would be sufficient to supply all electricity needed, even though in many cases local companies might aid in the distribution of the current. Thus unnecessary

duplication of plants and equipment would be avoided. During the past five years, however, as has been previously suggested, the enormous expense involved in extending overhead construction to remote places has rather effectively retarded the growth which might otherwise have taken place in this phase of the industry.

Table 53

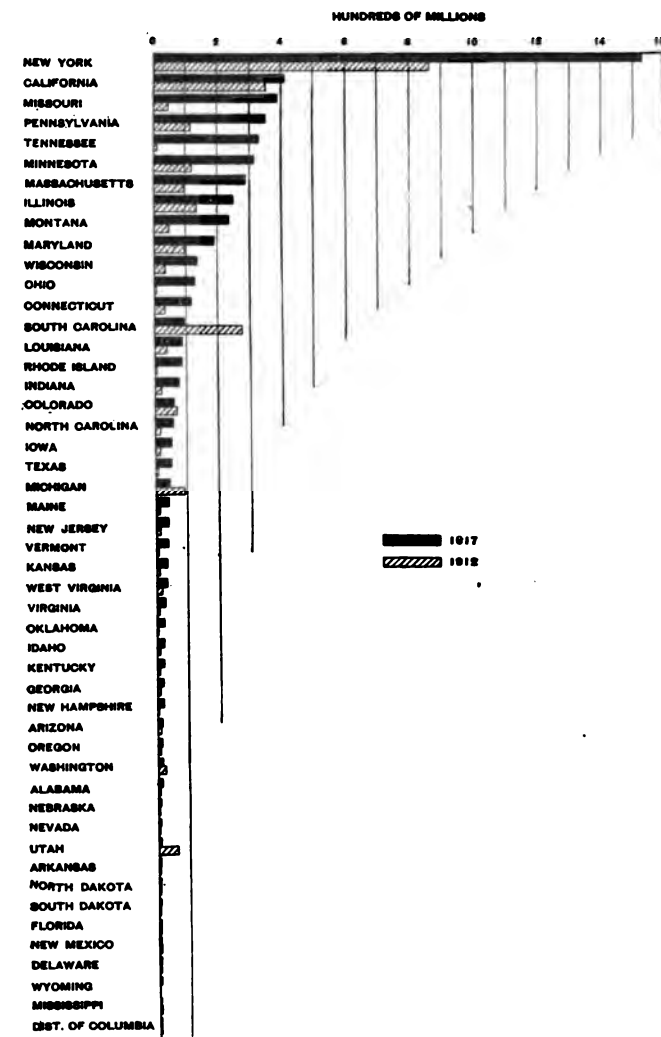
DIVISION. ¹	Census year.	CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—KILOWATT HOURS PURCHASED, BY GEOGRAPHIC DIVISIONS: 1917 AND 1912.		
		Total.	Central electric stations.	Electric railways.
United States.....	1917	10,553,094,004	5,605,745,962	4,947,348,042
	1912	5,630,861,358	2,613,502,605	3,017,358,753
New England.....	1917	771,186,984	578,110,859	193,076,125
	1912	232,382,012	136,821,236	95,560,776
Middle Atlantic.....	1917	3,550,175,198	1,917,380,779	1,632,794,419
	1912	1,884,722,386	989,404,314	895,318,072
East North Central.....	1917	2,046,026,703	615,605,822	1,430,420,881
	1912	1,073,512,511	276,742,512	796,769,999
West North Central.....	1917	1,066,035,177	730,508,038	275,527,139
	1912	383,167,448	183,535,438	199,632,010
South Atlantic.....	1917	839,261,940	416,165,234	423,096,706
	1912	706,663,959	407,716,658	298,947,301
East South Central.....	1917	563,459,551	355,590,851	207,868,700
	1912	57,811,414	15,948,772	41,862,642
West South Central.....	1917	228,053,605	157,603,725	70,449,880
	1912	92,487,788	38,763,468	53,724,320
Mountain.....	1917	420,967,558	338,811,725	82,155,833
	1912	259,796,097	188,201,530	71,594,567
Pacific.....	1917	1,067,927,388	435,968,929	631,958,359
	1912	940,317,743	376,368,677	563,949,066

¹ See p. 18 for states composing the several geographic divisions.

The Census Bureau did not call for a separate return of the amount of current purchased by central stations and electric railways until 1912. Between that year and 1917, however, the total amount of current purchased by both central stations and electric railways, as shown in Table 53, has almost doubled, increasing from 5,630,861,358 kilowatt hours in 1912 to 10,553,094,004 kilowatt hours in 1917. The actual increase, as well as the rate of increase, has been much greater for central stations than for electric railways, the relative increase amounting to 114.5 per cent for the former and only .64 per cent for the latter. The relation which the amount of current purchased bears to the total output of plants has remained practically unchanged for central stations (18.4 per cent in 1912 and 18.1 per cent in 1917), while the relative amount of current purchased has increased for electric railways from 33.5 per cent to 40.6 per cent.

So far as the different divisions are concerned, the electric railways have experienced the greatest growth in actual quantity of current purchased in the Middle Atlantic and the East North Central, these two divisions together reporting almost three-fourths of the total increase for the United States. For central electric stations the greatest actual increase in number of kilowatt hours purchased is found in the Middle Atlantic division, where it is not far from 1,000,000,000 kilowatt hours. This is followed by the West North Central, with an increase of more than 600,000,000

kilowatt hours, and the New England division, with about 440,000,000. As compared with the total output of stations in the different divisions—that is, with the total amount of current generated and purchased—it appears that the highest relative amount of current purchased, 30.8 per cent, is found in the West North Central division. This is followed by the East South Central, the West South Central, and the New England divisions, all of which report purchased current to the extent of about 25 per cent of their total output. The lowest percentages are met with in the East North Central states (9.7) and in the Pacific division (12.3).

DIAGRAM 12.—PURCHASED CURRENT, KILOWATT HOURS, BY STATES: 1917.

In Table 54 is shown the number and output of all stations, both commercial and municipal, classified according to whether they generate or purchase all of their current, as well as according to the proportion generated or purchased in excess of 50 per cent of the total output but under 100 per cent.

OUTPUT AND DISPOSAL OF CURRENT.

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Table 54

		CENTRAL ELECTRIC STATIONS—CLASSIFICATION OF COMMERCIAL AND MUNICIPAL STATIONS ACCORDING TO PROPORTION OF CURRENT GENERATED AND PURCHASED: 1917 AND 1912.									
	Census year.	Stations generating—					Stations purchasing—				
		All current.		50 per cent but under 100 per cent.			All current.		50 per cent but under 100 per cent.		
		Number of stations.	Number of kilowatt hours generated.	Number of stations.	Number of kilowatt hours generated.	Number of kilowatt hours purchased.	Number of stations.	Number of kilowatt hours purchased.	Number of stations.	Number of kilowatt hours generated.	Number of kilowatt hours purchased.
Total.....	1917	4,556	7,179,459,175	355	17,121,115,660	1,801,805,635	1,418	1,236,670,848	213	1,137,728,437	2,567,269,479
	1912	4,348	6,398,615,457	211	5,010,805,110	542,099,262	575	1,260,918,982	87	159,689,288	801,484,361
Commercial.....	1917	2,887	6,306,496,189	288	16,959,607,958	1,794,975,303	877	1,074,545,276	172	1,132,879,036	2,543,756,984
	1912	2,962	5,908,791,606	180	4,967,072,784	539,259,526	439	1,207,304,288	78	155,718,765	778,358,414
Municipal.....	1917	1,669	872,962,986	67	161,507,702	6,900,332	541	162,125,572	41	4,849,401	23,512,496
	1912	1,386	489,822,884	31	43,732,326	2,839,736	136	62,614,694	9	3,970,523	23,125,947
PER CENT OF INCREASE. ¹											
Total.....		4.8	12.2	68.2	241.7	232.4	146.6	-2.6	144.8	612.5	220.3
Commercial.....		-2.5	6.7	60.0	241.4	232.8	99.8	-11.0	120.5	627.5	226.8
Municipal.....		20.4	78.2	116.1	269.3	143.0	297.8	158.9	355.6	22.1	1.7
PER CENT DISTRIBUTION.											
Total.....	1917	69.6	28.2	5.4	67.3	32.1	21.7	22.1	3.3	4.5	45.8
	1912	83.3	55.3	4.0	43.3	23.7	11.0	48.6	1.7	1.4	30.7
Commercial.....	1917	68.3	25.8	6.8	69.5	33.2	20.8	19.8	4.1	4.6	47.0
	1912	81.0	53.6	4.9	45.0	21.4	12.0	47.8	2.1	1.4	30.8
Municipal.....	1917	72.0	84.0	2.9	15.5	3.6	23.3	84.2	1.8	0.5	12.2
	1912	88.7	91.1	2.0	8.1	3.2	8.7	70.7	0.6	0.7	26.1
AVERAGE OUTPUT PER STATION.											
Total.....	1917		1,575,825		48,228,495	5,075,509		872,123		5,341,448	12,062,908
	1912		1,471,623		23,747,892	2,569,191		2,208,555		1,835,509	9,212,464
Commercial.....	1917		2,184,446		58,887,528	6,232,310		1,225,251		6,586,506	14,789,286
	1912		1,994,865		27,594,849	2,995,886		2,750,124		1,996,394	9,978,964
Municipal.....	1917		523,046		2,410,563	102,990		299,678		118,278	573,476
	1912		353,408		1,410,720	91,604		460,402		441,109	2,569,560

¹ A minus sign (—) denotes decrease.

It is interesting to find that the group of plants generating all current has increased but little, either in number or in output, since 1912, the percentage of increase being 4.8 and 12.2, respectively. In this group, also, there has been an actual decrease of 2.5 per cent in number of commercial plants, from 2,962 in 1912 to 2,887 in 1917, whereas municipal plants have shown an increase of 20.4 per cent during the same period, combined with a growth of 78.2 per cent in number of kilowatt hours generated. Those plants purchasing all current have shown by far the greatest actual increase in number, 843, though for commercial and municipal stations combined there has been a decrease of 2.6 per cent in output. This decrease, however, is caused solely by the conditions found in the group of commercial plants. Three very large commercial stations in the state of New York which, in 1912, purchased all of their current were, in 1917, as a result of certain combinations, generating as well as purchasing current. One of these stations is included in the group which generated "50 per cent but under 100 per cent" of the total output, and two in the group which purchased "50 per cent but under 100 per cent" of the total output. Municipal plants purchasing all current reported a large and wholly consistent increase both in number of stations and in output. Plants generating "50 per cent but under 100 per cent" of their total output formed a very small proportion of the total number of stations (5.4 per cent), but generated about two-thirds of all current.

The relative increase in the amount of current generated by this group has been 241.7 per cent since 1912, and the increase in the number of kilowatt hours which they purchased has been almost equally rapid. The group purchasing "50 per cent but under 100 per cent" has been subject to the most rapid rate of increase in the number of kilowatt hours generated, from 159,689,288 in 1912 to 1,137,728,437 in 1917, or 612.5 per cent, though in number they were least important and they ranked next to the lowest in total output. The actual increase in number of kilowatt hours purchased by this group, from 801,484,361 to 2,567,269,479, has been higher than in any other. It must be mentioned, however, that practically all the changes are accounted for by commercial plants. Municipal plants in this group, while increasing considerably in numbers, have shown almost no change either in the quantity of current generated or purchased.

Perhaps some further mention should be made of the relative quantities of current generated or purchased by the several groups as classified in Table 54. It appears, accordingly, that both for commercial and municipal plants the proportion which generated all current has decreased since 1912, until at the later date the percentage distribution of this group for both classes of plants was about the same, 68.3 and 72 per cent, respectively. In number of kilowatt hours generated, however, this class of commercial plants reported only 25.8 per cent of all current produced by

them, whereas the municipal stations reported 84 per cent. On the other hand, municipal plants in the group generating "50 per cent but under 100 per cent" of their total output were relatively negligible in number and output, but the corresponding commercial plants generated 69.5 per cent of the total current produced by all commercial plants and purchased 33.2 per cent of the total number of kilowatt hours purchased. It is further interesting to find that a relatively small proportion of the total current purchased by commercial plants, 19.8 per cent, was bought by that group which generated no current, whereas 84.2 per cent of all current purchased by municipal plants was reported in this group.

The average output of stations, according to the above classification, has been subject to highly significant changes. No doubt some will be surprised to find that the number of kilowatt hours generated per plant producing all current has increased so little during the past five years, about 7 per cent. However, the increase in the case of municipal plants has been more marked, nearly 50 per cent. In 1917 commercial plants in this group averaged 2,184,446 kilowatt hours per station and municipal plants 523,046. The averages for the group which generated between 50 and 100 per cent of the total output were overwhelmingly greater than the averages for any other group. In fact, the total output, including both current generated and purchased, was more than 65,000,000 kilowatt hours per plant for commercial stations and more than 2,500,000 kilowatt hours for municipal stations. Those municipal plants which purchased between 50 and 100 per cent of their total output have decreased very rapidly in size since 1912, while the corresponding commercial stations have grown from an average combined output of nearly 12,000,000 kilowatt hours in 1912 to an output of more than 21,000,000 kilowatt hours in 1917. Finally, the decrease in average output of those stations which purchased all current is very marked—from 2,750,124 to 1,225,251 kilowatt hours for commercial stations and from 460,402 to 299,678 kilowatt hours for municipal plants. This decrease in the case of commercial plants has been occasioned in no small degree by the fact that some of the largest plants reporting in this group in 1912 have since been absorbed by other plants which generate some current. The tendency, however, toward an increase in number of small purchasing plants is sufficiently evident and is a result not only of the installation of new plants, but is also due to the dismantling of many smaller and uneconomically operated stations which formerly produced current.

Table 55 shows for geographic divisions, for 1917 and 1912, the distribution of plants according to the classification already used in Table 54. A few of the facts herein disclosed merit attention. In the New England, Middle Atlantic, East North Central, and

Pacific divisions there has been a very notable decrease in the number of plants which generate all current, while the only conspicuous increase in number for this group has been in the West North Central division. Every division, on the other hand, has witnessed an increase in the number which generated between 50 and 100 per cent of their current as well as in the number which purchased either all current or between 50 and 100 per cent of their output. Both those plants which generated and which purchased all current were by far the most numerous in the East North Central and the West North Central divisions, which combined reported, in 1917, 48.9 and 46.9 per cent, respectively, of the total number of all plants in these groups. The Middle Atlantic, East North Central, and West North Central divisions reported the greatest increases in the number of commercial plants purchasing all current, while for municipal plants the greatest increases were in the East North Central and West North Central divisions. So far as the output is concerned, commercial plants generating all current reported a decrease in quantity in five divisions—the New England, Middle Atlantic, West North Central, South Atlantic, and Mountain. In the last three divisions mentioned this decrease in quantity of current generated (37.5 per cent, 21.3 per cent, and 32.2 per cent, respectively) has been accompanied by a considerable increase in the number of stations (22.3 per cent, 13.6 per cent, and 16.7 per cent, respectively). These changes, of course, indicate an unexpected increase in the number of smaller generating stations in the sections under consideration. The really large commercial generating plants appear to be found in practically every division under the group which produced between 50 and 100 per cent of the total output. Municipal plants which generated all current have shown an increase in output in all divisions in spite of the decrease in number of stations which has occurred in some divisions. Among plants purchasing all current there has been in every case an increase in output for municipal stations. There has also been an increase in all divisions for the corresponding commercial plants, with the exception of the Middle Atlantic, which reported in 1917 almost 40 per cent of the total output for this group. The almost 50 per cent decrease in output for this division (from 781,767,031 in 1912 to 420,533,674 in 1917) has already been explained as being caused by certain changes in several very large New York plants.

Finally, it is interesting to note that the largest average output for commercial stations generating all current in 1917 is to be found in the Middle Atlantic and the Pacific divisions, though in the former the size is much greater than in the latter (almost 8,000,000 kilowatt hours as opposed to somewhat more than 4,000,000). The largest commercial plants generating more than 50 per cent of their current are to be found in the Mountain and the Pacific divisions, the average

OUTPUT AND DISPOSAL OF CURRENT.

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amount generated by each of these divisions being more than 100,000,000 kilowatt hours per plant. The municipal generating plants average largest in output in the Pacific division, followed by the New England and the East North Central. The lowest average for commercial plants which generated all current was

reported by the West North Central division, in which the average output was less than 500,000 kilowatt hours per plant, and the lowest average for municipal plants in the same group was reported by the West South Central division, in which the average was about 228,000.

CENTRAL ELECTRIC STATIONS—NUMBER AND OUTPUT OF COMMERCIAL AND MUNICIPAL STATIONS, CLASSIFIED ACCORDING TO PROPORTION OF CURRENT GENERATED AND PURCHASED: 1917 AND 1912.

Table 55	DIVISION.	Census year.	STATIONS GENERATING—					STATIONS PURCHASING—				
			All current.		50 per cent but under 100 per cent.			All current.		50 per cent but under 100 per cent.		
			Number of stations.	Number of kilowatt hours generated.	Number of stations.	Number of kilowatt hours generated.	Number of kilowatt hours purchased.	Number of stations.	Number of kilowatt hours purchased.	Number of stations.	Number of kilowatt hours generated.	Number of kilowatt hours purchased.
TOTAL.												
United States.....	1917	4,556	7,179,459,175	355	17,121,115,660	1,801,905,635	1,418	1,236,670,848	213	1,137,728,437	2,567,269,479	
	1912	4,348	6,398,615,487	211	5,010,805,110	542,099,262	575	1,269,918,982	87	159,689,288	801,484,341	
New England.....	1917	155	525,662,496	52	1,172,282,172	177,131,347	141	144,754,181	35	137,639,404	256,225,331	
	1912	228	584,572,963	42	277,698,115	21,655,915	85	98,468,204	13	3,138,364	16,697,117	
Middle Atlantic.....	1917	361	2,243,291,006	68	5,062,154,240	483,170,427	202	430,451,842	48	353,872,517	1,003,758,510	
	1912	469	2,314,183,960	41	1,214,247,975	99,555,870	111	783,105,328	28	20,173,370	106,743,116	
East North Central.....	1917	936	1,778,552,888	82	3,946,803,177	236,481,084	324	267,389,624	43	31,794,070	111,735,114	
	1912	1,085	1,106,482,988	46	1,410,682,647	73,184,158	116	170,132,494	13	10,798,762	33,426,866	
West North Central.....	1917	1,290	500,787,667	61	1,103,009,532	144,475,262	341	153,162,909	38	172,708,324	492,869,367	
	1912	991	627,485,575	15	62,675,243	9,561,090	64	112,164,613	7	22,434,624	61,809,735	
South Atlantic.....	1917	519	462,026,241	24	1,110,935,261	137,040,946	170	69,527,318	15	172,333,541	209,596,970	
	1912	427	542,980,143	14	156,839,790	652,189	65	38,202,431	6	30,076,464	368,862,038	
East South Central.....	1917	369	443,587,250	6	365,936,499	20,441,475	26	18,470,623	9	239,291,022	316,678,753	
	1912	309	207,750,044	4	19,344,002	4,768,915	14	7,959,846	3	670,762	3,220,011	
West South Central.....	1917	571	351,293,136	14	128,409,076	43,422,240	44	43,941,915	7	2,943,650	70,239,870	
	1912	468	181,874,548	6	51,662,515	1,297,373	11	1,674,415	2	410,598	35,791,680	
Mountain.....	1917	228	321,034,262	20	1,698,573,108	237,024,238	79	36,845,353	10	16,587,367	64,942,134	
	1912	185	462,941,518	16	342,662,680	49,285,180	41	27,616,785	8	39,789,684	111,300,565	
Pacific.....	1917	127	553,254,229	28	2,533,012,495	322,618,616	91	72,127,083	8	10,558,542	41,228,220	
	1912	146	370,344,048	27	1,475,022,143	282,138,572	68	30,595,866	7	32,296,665	63,634,239	
COMMERCIAL.												
United States.....	1917	2,887	6,306,496,189	288	16,959,607,958	1,794,905,303	877	1,074,545,276	172	1,132,879,036	2,543,756,084	
	1912	2,962	5,908,791,606	180	4,967,072,784	539,259,526	439	1,207,304,288	78	155,718,765	778,358,414	
New England.....	1917	128	476,312,193	47	1,165,343,388	176,187,750	107	125,425,710	29	134,634,096	245,812,676	
	1912	195	550,462,129	36	272,681,554	19,966,491	68	94,893,001	12	2,999,364	16,531,117	
Middle Atlantic.....	1917	280	2,205,097,262	59	5,059,762,690	482,657,702	174	420,533,674	43	353,372,211	1,003,038,965	
	1912	399	2,285,044,271	39	1,214,037,757	99,541,255	102	781,767,031	27	20,134,055	106,662,236	
East North Central.....	1917	520	1,380,244,998	66	3,937,078,357	235,801,562	199	197,237,840	33	81,398,214	107,203,428	
	1912	654	864,751,068	37	1,405,274,082	72,768,578	86	135,477,620	9	10,298,893	30,266,658	
West North Central.....	1917	757	354,416,614	42	1,096,577,451	142,738,181	141	136,269,850	30	172,573,835	491,072,759	
	1912	619	567,437,268	10	60,995,839	9,362,068	42	109,120,292	7	22,434,624	61,809,735	
South Atlantic.....	1917	293	388,716,270	18	1,108,519,705	136,796,505	79	39,885,454	8	171,962,222	205,032,896	
	1912	258	493,982,640	11	156,511,950	637,406	33	25,555,820	6	30,076,464	368,862,038	
East South Central.....	1917	224	407,261,372	6	365,936,499	20,441,475	19	17,391,411	7	239,080,690	316,678,901	
	1912	185	176,321,298	3	19,107,902	4,766,415	11	7,664,581	3	570,762	3,220,011	
West South Central.....	1917	392	310,433,516	14	128,409,076	43,422,240	33	40,357,001	6	2,851,450	69,939,570	
	1912	370	159,033,637	5	51,628,255	1,282,373	9	859,127	1	383,604	35,146,130	
Mountain.....	1917	182	307,883,590	14	1,692,936,881	236,847,223	59	33,204,041	9	16,485,367	64,837,659	
	1912	156	454,329,021	14	342,471,764	49,109,668	33	26,004,972	8	39,789,684	111,300,566	
Pacific.....	1917	111	476,030,384	22	2,405,044,211	320,012,665	66	54,240,295	7	10,520,952	41,165,130	
	1912	126	357,430,274	25	1,444,363,681	281,935,272	65	25,961,894	5	29,026,315	44,569,924	
MUNICIPAL.												
United States.....	1917	1,669	872,962,986	67	161,507,702	6,900,332	541	162,125,572	41	4,849,401	23,512,496	
	1912	1,396	489,823,881	31	43,732,326	2,539,736	136	62,614,694	9	3,970,523	23,125,947	
New England.....	1917	27	49,350,303	5	6,938,784	943,597	34	9,328,471	6	3,005,309	10,412,655	
	1912	33	34,110,834	6	4,996,561	1,689,424	17	3,575,203	1	139,000	166,000	
Middle Atlantic.....	1917	81	38,193,744	9	2,391,550	512,725	28	9,918,168	5	500,306	719,545	
	1912	90	29,139,689	2	210,218	14,615	9	1,338,297	1	39,315	80,880	
East North Central.....	1917	416	398,307,890	16	9,724,820	679,522	125	70,151,784	10	395,856	4,631,686	
	1912	431	241,731,620	9	5,408,565	425,580	30	34,654,874	4	499,869	3,166,202	
West North Central.....	1917	533	146,341,053	19	6,432,061	1,737,061	200	16,893,059	8	134,489	1,797,108	
	1912	372	60,048,307	5	1,679,404	199,022	22	3,044,321	—	—	—	
South Atlantic.....	1917	226	73,309,971	6	2,415,656	244,441	91	29,641,864	7	371,319	4,564,074	
	1912	169	48,997,508	3	327,840	114,783	32	12,646,611	—	—	—	
East South Central.....	1917	145	36,225,878	—	—	—	7	1,079,212	2	210,332	1,024,862	
	1912	124	31,428,746	1	236,100	2,500	3	295,315	—	—	—	
West South Central.....	1917	179	40,859,620	—	—	—	11	3,584,914	1	92,200	300,000	
	1912	118	22,840,911	1	34,260	15,000	2	815,288	1	21,989	645,580	
Mountain.....	1917	46	13,150,682	6	5,636,527	177,015	20	3,641,312	1	102,000	104,475	
	1912	29	8,612,497	2	190,916	175,512	8	1,610,813	—	—	—	
Pacific.....	1917	16	77,223,845	6	127,968,284	2,005,951	25	17,886,788	1	37,590	58,100	
	1912	20	12,913,774	2	30,668,462	203,300	13	4,633,972	2	3,270,350	19,064,315	

Disposal of current.—Table 56 combines in a convenient way comparative data regarding the output and disposal of current for commercial and municipal plants. From the data here given we find that the proportion which purchased current bears to the total output of stations has been somewhat smaller at both periods for municipal stations than for the other group.

In this connection mention should be made of the fact that not all of the current purchased by central stations is also generated by them, for a large though indeterminate quantity is sold to central stations by electric railways. It frequently happens, also, that current sold to one station is resold to another plant, so that there is bound to be a certain amount of duplication in the figures for purchased current, though only by considering all current, both generated and purchased by a plant, can we have a line on the extent of business done by that plant in relation to its customers.

Table 56

	CENTRAL ELECTRIC STATIONS—TOTAL OUTPUT AND DISPOSAL OF CURRENT: 1917 AND 1912.		
	Total.	Commercial.	Municipal.
Output:			
1917—			
Total.....	31,044,049,234	29,812,190,746	1,231,858,488
Kilowatt hours generated.....	25,438,308,272	24,398,983,183	1,039,320,089
Kilowatt hours purchased.....	5,605,745,962	5,413,207,563	192,538,399
1912—			
Total.....	14,182,612,490	13,556,505,383	626,107,107
Kilowatt hours generated.....	11,569,109,885	11,031,583,155	537,626,730
Kilowatt hours purchased.....	2,613,502,605	2,524,922,228	88,580,377
Per cent of total output:			
1917—			
Kilowatt hours generated.....	81.9	81.8	84.4
Kilowatt hours purchased.....	18.1	18.2	15.6
1912—			
Kilowatt hours generated.....	81.6	81.4	85.8
Kilowatt hours purchased.....	18.4	18.6	14.2
Disposal of current, 1917:			
For light.....	5,112,516,949	4,445,217,785	667,299,164
For power.....	13,174,827,277	12,833,191,106	341,636,171
To other public service corporations.....	7,464,620,574	7,444,108,488	20,512,086
Other purposes (nonrevenue).....	831,473,947	821,522,389	9,951,558
Distribution and line losses.....	4,460,610,487	4,268,150,978	192,459,509
Average per plant—			
For light.....	781,491	1,052,372	287,877
For power.....	2,013,884	3,038,161	147,384
To other public service corporations.....	1,141,030	1,762,336	8,849
Other purposes (nonrevenue).....	127,098	194,489	4,293
Distribution and line losses.....	681,842	1,010,462	83,028
Per cent of total output, 1917—			
For light.....	16.5	14.9	54.2
For power.....	42.4	43.0	27.7
To other public service corporations.....	24.0	25.0	1.7
Other purposes (nonrevenue).....	2.7	2.8	0.8
Distribution and line losses.....	14.4	14.3	15.6

As no attempt was made before 1917 to secure data regarding the disposal of current for various purposes, a good deal of difficulty was encountered in securing satisfactory information from those smaller plants whose records were not systematically kept. The absence of station meters and frequently of customers' meters, in addition to careless keeping of records and absence of engineering training on the part of some managers, has no doubt led to some inaccuracy in specific cases. The utmost care, however, was exercised by the Census Bureau, all doubtful cases being checked through the proper channels, so that it is

thought that the figures now assembled may be fairly accepted for census uses. At any rate, the more numerous though relatively unimportant errors arising in connection with the smaller stations would not be sufficient to have any appreciable effect upon totals, wherein the larger plants which keep satisfactory records greatly predominate. It may be said that in general much more difficulty was experienced in getting satisfactory answers from municipal plants in reply to this part of the schedule than from commercial stations.

Perhaps the reader's attention should be called to the fact that some stations selling current for power do not keep a separate record of the same, but include it with current sold for lighting purposes. As a result the amount of current reported by all plants as delivered for light is probably somewhat in excess of the actual amount so used. Under "current sold for power" it is probable that some plants mistakenly reported current which was furnished to street railways and which should accordingly have been entered under current sold "to other companies." It should be mentioned also that as there was not a separate item on the schedule for reporting current used "for heating purposes," an attempt was made to have current so used uniformly entered under "power." The fourth item under disposal of current, "all other purposes," presumably includes only that portion of the output which was used at the various stations for light, excitation, etc. Finally, the accuracy of the item "distribution and line losses" will, of course, depend upon the care with which the output is measured at the stations and on the customers' premises. Whenever, as is frequently the case in smaller plants, these data are largely estimates, some slight error will be unavoidable, though, as previously suggested, everything has been done to reduce such errors to the minimum.

A further examination of Table 56 shows how unimportant relatively was the business done by municipal plants. Only in current sold for lighting purposes was there any significant approach in size to the commercial stations. The average amount of current furnished per plant for light, including street lighting, was 1,052,372 kilowatt hours for the latter and 287,877 for the former. Commercial plants, however, sell for power more than twenty times as much current on the average as do municipal plants, while in the case of the latter the average sales of current to other public service corporations, 8,849 kilowatt hours, are utterly negligible.

Exactly what portion of the total amount of current sold to other public service corporations, 7,464,620,574 kilowatt hours, was furnished to central stations it is impossible to state. Probably, however, not far from three-fifths of this amount was so disposed of. In numerous instances a large distributing company will

purchase current in bulk from the company which generates it, passing it on in turn to other central stations. The remainder of the amount reported in answer to this inquiry went to street railways, which in turn sold a considerable quantity of current among themselves and furnished an additional though uncertain amount to central stations. Whatever apparent discrepancies there may be between the total number of kilowatt hours reported as purchased by central stations and street railways and the amount which seems to have been sold by them to some other public service corporations is, as just stated, mostly hidden under "power" sales.

Attention should be called to the percentage relations which the different items bear to the total output of stations for the two groups of plants. Accordingly, 54.2 per cent of the entire output of municipal plants went for lighting purposes, whereas little more than one-quarter as much, 14.9 per cent, was supplied for the same uses by commercial stations. The difference in the relative quantities of current supplied for power was far less marked, 43 per cent for commercial and 27.7 per cent for municipal plants. The former sold at least one-quarter of their entire output to other companies, including street railways, whereas the latter disposed of less than 2 per cent in this manner. The nonrevenue uses of current, while comparatively small in either case, were relatively much higher in commercial stations (2.8 as opposed to eight-tenths of 1 per cent). This is a condition which might be expected on account of the difference in size and nature of business carried on by most commercial stations, which not only use more current at the generating plants themselves, but also maintain large offices and numerous showrooms and advertising signs, all of which consume a large quantity of current for light. It is possible, also, that in some instances the requirements of this item were misinterpreted, and occasionally relatively small entries may have been made by large commercial stations doing many kinds of business which properly belonged with one of the other items, but for which there was no separate place on the schedule.

The per cent of distribution and line losses does not appear to be widely different for the two groups of plants, 14.3 per cent for commercial stations and 15.6 per cent for municipal stations. One or two qualifications, however, should be made. In the first place, an examination of the schedules disclosed the fact that municipalities in general were disposed to misinterpret or, at any rate, to underestimate the item of distribution and line losses. This was due largely to the fact that so many of this group of plants were not supplied with station meters, and, accordingly, estimated their total output on the basis of the current actually delivered to customers. As most of these plants are comparatively small and as their total output forms a small proportion of the total for both groups of stations,

errors here made would show up more seriously than in the case of commercial plants. Accordingly, there is good reason to believe that the item "distribution and line losses" has been put at too low a figure for municipal plants. Among commercial stations, on the other hand, the larger plants keeping accurate records so greatly outweigh the smaller that any errors made in this respect will be negligible. When consideration is given, however, to the wide extent of territory served by the average commercial station, the total number of which, 4,224, supply current to 11,349 separate municipalities, and some of which serve more than 100 different places, it might be expected, other things being equal, that commercial stations would be subject to distribution and line losses relatively far greater than would be met with in the municipal plants, which, with a very few unimportant exceptions, serve only the municipalities in which they are located.

Final attention may also profitably be called to the proportion of current delivered for various purposes, estimated on the basis of the total amount of current sold instead of the total output. Table 57, accordingly, shows the relations which exist. Commercial stations sell 51.9 per cent for power, or more than one-half of the current which they actually deliver to customers, while 30.1 per cent is sold to other companies. Municipalities, on the other hand, furnish almost two-thirds of their current for light, including free service, while one-third goes for power, and only one-fiftieth to other companies.

Table 57	PER CENT DISTRIBUTION OF CURRENT DELIVERED FOR VARIOUS PURPOSES: 1917.		
	All stations.	Commer- cial.	Municipal.
Total.....	100.0	100.0	100.0
Light.....	19.8	18.0	64.8
Power.....	51.2	51.9	33.2
To other companies.....	29.0	30.1	2.0

In this place a few data of general interest may well be mentioned. In the group of commercial stations there were 1,742, or 41.2 per cent of the total, which sold no current for power. Municipal plants similarly reported in the same class 1,105 stations, or 47.7 per cent of the total. There are, again, 53 commercial plants selling current only for power or both for power and to other companies. Also, 42 commercial stations, with an output of 285,377,527 kilowatt hours, sell all their current to other companies. Again, 5 commercial plants and 67 municipal plants do only a street or park lighting business, while 7 other municipal plants do a combined street lighting and municipal power business. Finally, 822 stations, of which 710 are commercial and 112 municipal, sell current to other public service corporations.

Average output per plant according to population groups.—Before leaving this subject it will be worth while to make some attempt to show the average amount of current delivered for light and for power by commercial and municipal stations, arranged according to the population groups discussed in Chapter II (p. 37), together with the number of kilowatt hours consumed per capita for the different services. These data are summarized in Table 58.

Table 58

POPULATION GROUP.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS GROUPED ACCORDING TO POPULATION—AVERAGE PER PLANT AND PER CAPITA CONSUMPTION OF CURRENT FOR LIGHT AND POWER: 1917.				
	Average per plant.			Kilowatt hours consumed per capita.	
	Population of districts served.	Kilowatt hours sold for light.	Kilowatt hours sold for power.	Light.	Power.
TOTAL.					
All districts.....	9,696	787,858	1,939,595	81	200
Under 1,000.....	534	23,451	121,518	44	228
1,000 but under 2,000.....	1,266	65,024	138,868	51	110
2,000 but under 5,000.....	2,744	160,567	260,017	59	95
5,000 but under 10,000.....	5,845	392,456	628,119	67	107
10,000 but under 25,000.....	12,529	850,209	3,264,906	68	261
25,000 but under 50,000.....	26,102	1,928,652	5,228,392	74	200
50,000 but under 100,000.....	47,315	3,454,295	12,704,137	73	269
100,000 but under 200,000.....	104,092	6,689,312	18,900,461	64	182
200,000 but under 500,000.....	194,814	15,909,030	41,862,287	82	215
500,000 and over.....	324,611	33,966,567	67,842,555	105	209
COMMERCIAL.					
All districts.....	13,536	1,065,719	2,935,601	79	217
Under 1,000.....	522	21,888	180,558	42	346
1,000 but under 2,000.....	1,279	62,836	230,591	49	180
2,000 but under 5,000.....	2,821	156,923	393,342	56	139
5,000 but under 10,000.....	6,184	370,431	898,734	60	145
10,000 but under 25,000.....	13,831	873,166	4,137,675	63	299
25,000 but under 50,000.....	28,072	1,997,638	5,992,850	71	213
50,000 but under 100,000.....	51,146	3,559,894	14,080,914	70	275
100,000 but under 200,000.....	105,864	6,775,658	20,185,050	64	191
200,000 but under 500,000.....	194,490	15,565,339	43,594,782	80	224
500,000 and over.....	370,170	35,804,295	76,307,555	97	206
MUNICIPAL.					
All districts.....	5,898	287,877	147,384	49	25
Under 1,000.....	570	26,552	4,312	47	8
1,000 but under 2,000.....	1,317	67,930	17,339	52	13
2,000 but under 5,000.....	2,878	165,693	75,090	58	26
5,000 but under 10,000.....	6,318	427,068	202,867	68	32
10,000 but under 25,000.....	13,718	777,567	504,107	57	37
25,000 but under 50,000.....	34,610	1,535,176	868,150	44	25
50,000 but under 100,000.....	59,433	2,679,997	2,607,771	45	44
100,000 but under 200,000.....	129,203	5,552,682	5,412,276	43	42
200,000 but under 500,000.....	283,333	21,568,081	14,142,361	76	50
500,000 and over.....	593,618	20,872,754	7,529,434	35	13

Attention should first be called to the fact that the average population served per plant was similar for both classes of stations in all 5 groups serving less than 25,000 people. In these lower groups it is unusual to find a commercial and municipal plant operating in the same territory, nor does it often occur that more than one commercial station will be found in a given district of this size. Beyond this point, however—that is, in those groups serving from 25,000 population upward—municipal plants lead in every group in the average number of inhabitants served. The reason for this condition is evident. Municipal plants, as in

the lower population groups, serve a single locality, and, with one or two exceptions, even in the larger places only one station is found in a given municipality. There are, however, frequently several commercial stations operating in the same territory, and in the case of those numerous companies which serve a large number of separate localities, this condition is even more common. It not infrequently happens that while one commercial station does the greater part of the electric light and power business in a given district, there may be several others whose output is delivered almost wholly for power used by large manufacturing concerns or sold largely in bulk to central stations. The former are, of course, always included in this tabulation, as well as the latter, if they incidentally sell some current for lighting or power purposes. By the inclusion of such plants the average population served by commercial stations in the higher groups is naturally somewhat reduced.

It is significant to find that in each population group up to 10,000 the average municipal plant supplies slightly more current for light than does the corresponding commercial plant, nor does the latter appear to have much advantage over the former until the highest group is reached. In the group between 200,000 and 500,000 population municipal plants are markedly in the lead. As just suggested, however, these averages for commercial stations are somewhat misleading, because a number of plants are included which sell no current for light (42), while many others do almost no lighting business. There is a total of 95 commercial stations which sell no current for light, 53 of which, for reasons earlier explained,¹ are omitted from this tabulation. The average amount of current sold for light by all commercial plants, 1,065,719 kilowatt hours, is almost four times as great as the average per municipal plant, 287,877 kilowatt hours.

Much more indicative of the true situation are the averages which show the number of kilowatt hours sold for power by population groups in the two classes. For both commercial and municipal plants there is a steady increase in the average power sales from the lowest to the highest group, except in the case of the highest group for municipal stations, for which the average was only about one-half that shown for the next highest group, but it is interesting to find that at every stage commercial stations are many hundred per cent in the lead. The average power sales for the commercial plants here tabulated are 2,935,601 kilowatt hours, or almost three times as great as their average light sales. For municipal plants, on the other hand, the average power sales were only 147,384 kilowatt hours, or about half the average light sales for the same group and only a little more than one-twentieth of the average power sales of commercial

¹ Chapter II, p. 38.

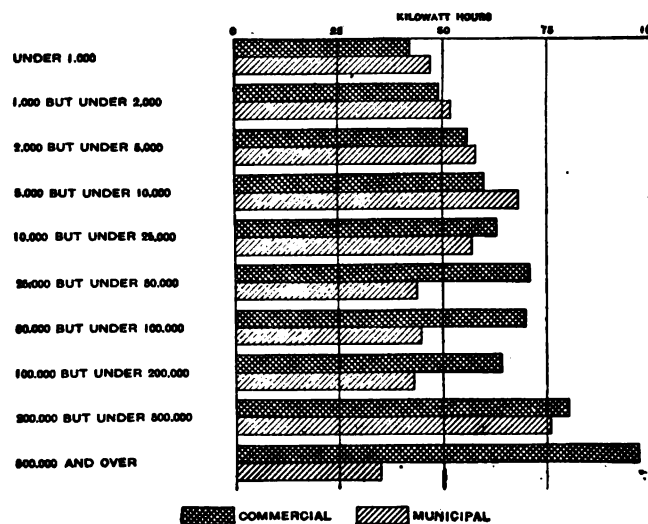
plants. It is true that there are many plants in both groups which report the sale of no current for power. Were these eliminated there would remain in this tabulation 2,429 commercial plants which sell current for power and 1,213 of the corresponding municipal plants. Using these figures we should find the average power sales per plant to be 5,283,323 kilowatt hours for the former and 281,646 kilowatt hours for the latter. In the case of commercial plants having total power sales of 588,798,449, 10 were omitted from this tabulation. If these were included, the average power sales for this group would be appreciably higher than here indicated.

Per capita consumption of current for light and power: 1917.—From the special tabulation already made it is possible to arrive at the per capita consumption of electric current for light and power according to the various population groups. An explanation of the method whereby the basic data were secured has already been made.¹ It should be noted in this connection that while we might reasonably expect to find a gradual increase in the per capita consumption of current for lighting purposes as the population of the districts served increases, yet some qualification must be made because of the fact that in the case of commercial plants the larger population frequently represents merely an aggregate of relatively small municipalities. In the case of municipal plants, also, stations serving the larger population groups in many instances supply current only for lighting the streets and public buildings. Accordingly, the indicated per capita consumption for this group will naturally be low. The element of chance plays a far greater part in the matter of power sales per capita. Frequently an electric station serving a small territory may furnish great quantities of power to local industries either for manufacturing or for mining, in which case the density of service will appear abnormally high. Hence, except for the fact that the larger industrial establishments, which normally use a great deal of electric current, are not ordinarily to be found in the smaller population districts, the mere population of the territory served gives little clew to the population per capita consumption of current for power.

In examining Table 58 it is apparent that in the four lowest groups municipal plants led by a narrow margin in the amount of current supplied for light per inhabitant. In view of the fact that, as will be explained in the following chapter,² the average municipal plant is, relative to its size, far more liberally equipped with street lamps, it is reasonable to assume that in all probability those municipalities which own their lighting systems are more generous in all of their public lighting, whether of streets, parks, or buildings, than are the municipalities served by commercial

stations. Local conditions might, of course, affect the situation in certain instances, though such differences are practically negligible when the average of large groups of plants is taken, as is here the case. Hence, no other explanation of the greater per capita consumption of current for light by the lower groups of municipal plants is apparent, since from analyses later to be made it will be found that the rates charged by municipal plants to private consumers in these groups do not tend to be much lower than the rates charged by corresponding commercial stations. In the population group between 10,000 and 25,000, municipal plants show a somewhat lower density of light service than do the corresponding commercial plants (57 as opposed to 63 kilowatt hours), but this difference is not greatly marked. In all remaining groups, however, commercial plants are very decidedly in the lead, except in the group between 200,000 and 500,000. The deficiency which the larger municipal plants show can no doubt be attributed mostly to the fact that many of them are furnishing current almost solely for public lighting purposes, while the commercial plants in the same territory do the general lighting business. However this may be, it is significant to find that the average number of kilowatt hours per capita supplied for light by all commercial plants is 79, while the average for all municipal plants is only 49. As the average for all plants in the United States is only 81 kilowatt hours, a little higher than the average for commercial plants, it appears that the actual duplication of territory served by municipal plants is relatively negligible.

DIAGRAM 13.—NUMBER OF KILOWATT HOURS SUPPLIED PER CAPITA FOR LIGHT BY COMMERCIAL AND MUNICIPAL PLANTS, ARRANGED ACCORDING TO POPULATION GROUPS: 1917.



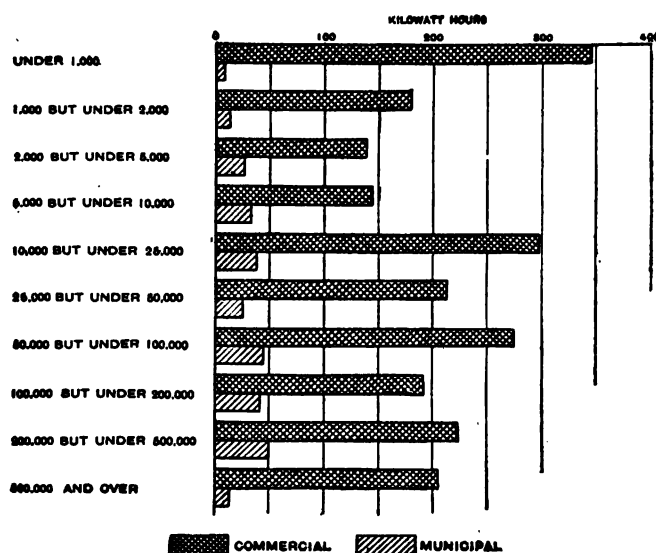
Certain striking contrasts are seen upon examination of the figures given in Table 58, showing the per capita consumption of power for commercial and

¹ Chapter II, p. 37.

² Chapter VII, p. 93.

municipal plants in the various population groups. First of all, attention must be called to the condition which prevails among the municipal plants, since, on the average, they supply only 25 kilowatt hours per capita for power, whereas the average commercial plant supplies 217 kilowatt hours, an amount which would be increased to 227 if the 10 large plants omitted from the tabulation were included. Municipal plants show a fairly constant growth in the quantity of power furnished per capita as the population groups increase, until the highest group is reached. At every stage, however, the output for this purpose is so low, being in all cases far less than the output for light, that the figures are almost unbelievable when compared with the conditions found in the corresponding commercial stations. It must, of course, be remembered that 74 municipal plants, or about 3 per cent of the total number, supply current only for municipal uses, 67 of which furnish no power. This, however, is by no means sufficient to account for the obvious differences which in this respect exist between the two groups of stations, particularly when we recall that about an equal percentage of each supplies no current for power purposes. Hence, the condition evidently prevails in those districts served by municipal plants where either few industries capable of using electric power are present or those industries which are in the field apparently are forced to produce their own electric power, except in those comparatively few instances in which commercial plants are serving the same territory. This condition probably indicates a great lack of business initiative on the part of municipal plants.

DIAGRAM 14.—NUMBER OF KILOWATT HOURS SUPPLIED PER CAPITA FOR POWER BY COMMERCIAL AND MUNICIPAL PLANTS, ARRANGED ACCORDING TO POPULATION GROUPS: 1917.



It is surprising to find that while the highest per capita consumption of current for power in any one group is only 50 kilowatt hours for municipal plants and the lowest only 8, the corresponding extremes for commercial plants are 346 and 139 kilowatt hours.

It is equally surprising to find that while, as would naturally be expected, the smallest per capita consumption (8) in municipal plants is met with in the lowest population group, the highest per capita consumption for power (346) is found in this same group of commercial plants. This condition in the latter is due to the fact that the states of Pennsylvania, West Virginia, Washington, and Arizona each reports a plant serving a very small population group, which supplies an unusually large quantity of current for power to manufacturing establishments or mines. But even if these abnormal cases were eliminated, the per capita amount of current supplied for power by commercial stations would still be about 50 kilowatt hours as opposed to only 8 for municipal plants supplying less than 1,000 population. Somewhat similar conditions, though far less marked, obtain among commercial plants in several of the other low population groups.

As a result of frequent inquiries which have been made during the past few years, it was deemed worth while to present figures showing as nearly as possible the per capita consumption of current for light and power, according to states and geographic divisions. It will, of course, be understood that the data can not always be considered absolutely accurate so far as different states are concerned, for reasons already pointed out in connection with the preceding study of per capita consumption. There may occasionally be some duplication of population which could not be discovered by the Census Bureau, and at this period it is not always possible to determine with accuracy the exact population of different municipalities. The material here presented, however, is nowhere else to be secured, and the percentage of error, particularly in the case of the different geographic divisions, will be very slight indeed.

In Table 59, therefore, is given not only the population of the various districts furnished with electric current but also the total population of all states according to the census estimate of January 1, 1918, which is the most nearly comparable date, since the schedules from central stations were to report conditions as of December 31, 1917. In some cases the estimated population may be considerably different from the true population, since the figures have generally been built up on the theory that the annual rate of increase in population in the different states since 1910 has been the same as the average rate of increase during the preceding decade. In 10 states, however, a population census was locally taken in 1915. These were New York, Rhode Island, New Jersey, Massachusetts, Iowa, Kansas, Florida, South Dakota, North Dakota, and Wyoming. Upon the whole, therefore, the ratio which appears to exist between the total estimated population of the different states and that portion of the population which is actually in a position to be supplied with electric current is a very close approximation. However, the

figures showing the per capita consumption of current for light and power, based on population actually served, will doubtless be even more accurate. From the nature of the service rendered by electric street railways, it was scarcely possible to include the power so used in the per capita consumption, nor would the figures have had any particular significance. Current sold to other central stations will, of course, ultimately appear in the returns as sold for light or power. Finally, it should be noted that the data assembled in

Table 59, as in preceding tables on the same subject, are not wholly complete, due to the necessary omission of 11 plants which supply to an uncertain population 104,700 kilowatt hours for light and 588,798,449 kilowatt hours for power. No doubt this amount of current should be included in computing the per capita consumption, since the amount of population actually involved in connection with the supply of such large quantities of power is practically negligible.

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—DENSITY OF ELECTRIC LIGHT AND POWER SERVICE IN THE UNITED STATES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	POPULATION.			Number of kilowatt hours consumed for light.	Number of kilowatt hours consumed for power.	PER CAPITA CONSUMPTION (BASED ON POPULATION ACTUALLY SERVED).	
		Districts served with current.	Census estimate, Jan. 1, 1918.	Percent of population served with electric current.			Light.	Power.
UNITED STATES.....	6,489	62,847,722	104,444,303	60.2	5,112,412,249	12,586,028,828	81	200
NEW ENGLAND.....	377	6,591,077	7,302,566	90.3	420,428,908	962,745,494	64	146
Maine.....	91	578,108	779,765	73.5	24,023,015	98,534,832	42	172
New Hampshire.....	58	382,267	445,390	85.8	19,008,406	29,191,528	50	76
Vermont.....	57	201,850	366,569	55.2	12,894,145	38,366,987	64	190
Massachusetts.....	120	3,769,586	3,804,381	99.1	246,026,275	498,349,682	65	132
Rhode Island.....	9	482,300	631,640	76.4	35,688,991	122,674,166	74	254
Connecticut.....	42	1,181,966	1,275,821	92.6	82,891,076	175,628,299	70	149
MIDDLE ATLANTIC.....	666	19,770,388	22,329,921	88.5	1,527,420,125	4,049,985,155	77	205
New York.....	326	10,165,376	10,563,585	96.3	958,781,017	2,214,436,204	94	218
New Jersey.....	62	2,694,555	3,047,282	88.4	137,658,117	289,340,369	51	107
Pennsylvania.....	278	6,910,452	8,729,054	79.2	430,980,991	1,546,158,582	62	224
EAST NORTH CENTRAL.....	1,378	13,335,406	20,018,689	66.6	1,319,668,089	2,182,324,980	99	164
Ohio.....	332	3,246,349	5,242,949	61.9	318,037,645	506,779,461	96	156
Indiana.....	236	1,646,064	2,844,829	57.9	111,516,382	220,786,350	68	134
Illinois.....	301	4,560,378	6,276,364	72.7	561,461,718	566,363,280	123	124
Michigan.....	238	2,424,100	3,113,972	77.8	223,592,830	642,508,477	92	255
Wisconsin.....	266	1,458,517	2,540,575	57.4	106,056,514	245,892,362	72	169
WEST NORTH CENTRAL.....	1,720	7,136,287	12,680,797	56.4	559,068,021	725,961,024	78	102
Minnesota.....	254	1,614,892	2,328,866	69.3	163,943,910	292,119,519	102	181
Iowa.....	322	1,098,950	2,224,771	49.2	77,032,091	55,800,569	70	51
Missouri.....	292	2,268,406	3,439,046	66.0	176,643,404	169,766,192	78	75
North Dakota.....	127	200,339	778,378	25.7	14,273,880	5,779,892	71	29
South Dakota.....	131	228,116	726,203	31.4	14,723,793	10,970,760	65	48
Nebraska.....	294	745,334	1,290,501	57.8	49,722,639	45,522,424	67	61
Kansas.....	300	985,220	1,863,082	52.8	62,696,824	146,021,678	64	148
SOUTH ATLANTIC.....	723	4,518,305	13,562,034	33.3	282,576,718	1,264,333,345	63	280
Delaware, District of Columbia, and Maryland.....	63	1,330,725	1,967,090	67.6	116,453,961	263,856,635	88	198
Virginia.....	94	615,487	2,223,527	27.7	22,880,468	73,045,745	37	119
West Virginia.....	72	363,964	1,425,883	25.5	46,162,481	113,244,904	127	311
North and South Carolina.....	238	1,156,833	4,102,272	28.2	48,215,369	687,341,251	42	504
Georgia.....	174	649,231	2,915,730	22.3	25,285,042	110,391,504	39	170
Florida.....	82	402,165	927,532	43.4	23,599,397	16,453,306	59	41
EAST SOUTH CENTRAL.....	410	2,422,376	9,082,884	26.7	134,979,387	287,617,110	56	119
Kentucky.....	125	887,909	2,401,320	37.0	53,708,123	45,000,910	60	51
Tennessee.....	106	639,157	2,312,941	27.6	41,263,713	70,649,999	65	111
Alabama.....	82	621,760	2,379,005	26.1	26,647,118	164,691,063	43	265
Mississippi.....	97	273,550	1,989,018	13.8	13,365,433	7,275,106	49	27
WEST SOUTH CENTRAL.....	636	3,526,324	10,542,614	33.4	203,973,735	213,709,122	58	61
Arkansas.....	96	398,218	1,779,655	22.4	18,973,852	9,690,497	48	24
Louisiana.....	85	660,522	1,870,866	35.3	50,124,948	26,033,482	76	39
Oklahoma.....	201	827,543	2,333,742	35.5	40,638,355	53,180,479	49	64
Texas.....	254	1,640,041	4,558,351	36.0	94,236,580	124,804,664	57	76
MOUNTAIN.....	334	1,671,888	3,381,994	49.4	182,350,621	1,458,604,860	109	873
Montana.....	60	224,810	479,655	46.9	32,761,568	791,750,693	146	3,522
Idaho.....	45	223,927	453,472	49.4	21,438,529	91,787,495	96	410
Wyoming.....	41	94,890	187,675	50.3	10,969,791	10,913,272	116	116
Colorado.....	69	467,759	1,001,451	46.7	55,946,573	148,089,878	120	317
New Mexico.....	19	94,798	430,332	22.0	5,756,408	6,991,626	61	74
Arizona.....	29	146,123	267,912	54.5	10,303,467	53,685,821	71	367
Utah.....	47	373,391	448,757	83.2	39,080,832	319,654,975	105	856
Nevada.....	14	46,185	112,740	41.0	6,103,453	35,731,100	132	774
PACIFIC.....	250	3,876,209	5,578,329	69.5	481,946,645	1,440,777,788	124	372
Washington.....	86	757,159	1,628,999	46.5	62,526,140	118,968,298	83	157
Oregon.....	67	627,472	875,117	60.3	26,011,223	55,573,337	49	105
California.....	97	2,591,578	3,074,223	84.3	393,406,282	1,266,236,153	152	489

¹ Population Apr. 15, 1910; decrease since 1900.

In many cases it is not easy to account for the wide differences in the per capita consumption of current for light in various geographic divisions and states. Sometimes, to be sure, current sold for power was included with that sold for light on the returns, but the

cases in which large quantities were involved in this way were comparatively rare and would not be sufficient to account for the noticeable discrepancies, which must, accordingly, depend largely upon local conditions. So far as the different divisions are concerned,

the Pacific leads with 124 kilowatt hours, followed by the Mountain (109) and the East North Central (99). Those states reporting the highest per capita consumption of current for lighting purposes are California (152), Montana (146), Nevada (132), West Virginia (127), Illinois (123), Colorado (120), Wyoming (116), Utah (105), and Minnesota (102). In four of these states—California, Montana, Nevada, and Utah—the bulk of the electric current was generated by means of water power and supplied at very favorable rates to customers who, no doubt, were rather wasteful in its use. It is further true that, with one or two exceptions, a great deal of mining is done in these sections, and probably a large quantity of current is used for lighting many of the mines. The high per capita consumption for light in Illinois (123), which is practically the same as the per capita power consumption (124), is doubtless accounted for by the inclusion of an appreciable amount of current actually sold for power with that sold for light in the case of one of the largest companies. The lowest per capita consumption for light is found in the East South Central division (56), the West South Central (58), and the South Atlantic (63). Among the states the lowest consumption is reported by Virginia (37), Georgia (39), Maine (42), North and South Carolina (42), Alabama (43), Arkansas (48), Mississippi, Oklahoma, and Oregon (49). In practically all of these the rural population is large and municipalities are correspondingly small, and, with two exceptions, they are all Southern states in which the Negro population is very dense. In these poorer districts the candle and the kerosene lamp doubtless still hold sway. Ten states—Iowa, Missouri, North Dakota, South Dakota, Nebraska, Florida, Kentucky, Mississippi, Arkansas, and Louisiana, in the order named—report higher per capita consumption for light than for power.

The per capita consumption of power in all districts served in the United States is 200 kilowatt hours, or 210 if the 10 large plants omitted from the tabulation be included. This figure indicates a density of power service about two and one-half times as great as the density of lighting service. The highest per capita consumption of current for power is met with in the Mountain division, which reports 873 kilowatt hours—a figure which is much more than twice as high as that shown by the Pacific division (372), which is second in rank. The South Atlantic division follows with a per capita consumption of 280 kilowatt hours. Upon examining the various states which compose these divisions, it appears that these extremely high figures are usually accounted for by only one or two states. In the Mountain division, for example, Montana shows a per capita consumption of 3,522 kilowatt hours for power, which is between four and five times as high as that found in Utah (856) or Nevada (774), the two closest rivals. In the entire Mountain division, however, with two exceptions, Wyoming and New Mexico, the per capita consump-

tion is higher than in most other states. This would seem to be accounted for by the enormous quantity of electric power used in mining operations in these sparsely populated states, particularly in Montana, Utah, and Nevada. In Idaho, also, a good deal of electricity generated by water power is used in the various farm operations as well as for heating purposes. California, in which are found the most extensive hydroelectric developments in any state in the Union, ranks among the highest in the per capita consumption of power (489 kilowatt hours), in addition to being first in use of current for lighting purposes. North and South Carolina, which have been combined in this tabulation owing to the difficulty in determining to which state belong portions of the population served, together show a per capita power consumption considerably higher than that found in California and rank fourth among all the states in this respect. Here, again, most current is generated by water power and is extensively used in textile and other mills. None of the so-called "industrial" states appear to have a per capita power consumption at all approaching the states already mentioned. This condition is in large measure accounted for by the fact that so much greater population is served in these more highly developed sections with light as well as with power. Accordingly, the population which must be used as our divisor is relatively far greater and the quotient is correspondingly less. Further, in these older states, many manufacturing establishments are using steam for motive power or are generating electricity in their own plants.

Subject to the qualifications and explanations which have earlier been made, perhaps attention should be directed briefly to the proportion of population which is reported as being served with electric current in the different sections of the country. Based on the census estimate for January 1, 1918, it appears that in the New England division 90.3 per cent of the total population was living in districts which presumably are in a position to be served with electric current. This division is closely followed by the Middle Atlantic, with 88.5 per cent, while the Pacific division, reports 69.5 per cent of the total population, and the East North Central 66.6 per cent. The highest ranking states are Massachusetts, with the somewhat questionable figure of 99.1 per cent, New York (96.3 per cent), Connecticut (92.6 per cent), New Jersey (88.4 per cent), New Hampshire (85.8 per cent), California (84.3 per cent), and Utah (83.2 per cent). In most of these states the ratio of urban population to rural population is extremely high, but it should be remembered that by far the greater number, at least two-thirds, of central electric stations in the United States are serving a population which is so small, under 2,500, that it is classified by the Census Bureau as "rural." The low ranking divisions are all in the South, the East South Central (26.7 per cent), the South Atlantic (33.3 per cent), and the West South

Central (33.4 per cent). In the states comprising these divisions we find an overwhelming proportion of country dwellers, though not all of the states showing a very low proportion of population served by electric plants are to be found in these sections. The following states are among the most sparsely served in the order named, all of which report less than 30 per cent: Mississippi (13.8 per cent), New Mexico (22 per cent), Georgia (22.3 per cent), Arkansas (22.4 per cent), West Virginia (25.5 per cent), North Dakota (25.7 per cent), Alabama (26.1 per cent), Tennessee (27.6 per cent), Virginia (27.7 per cent), and North and South Carolina combined (28.2 per cent).

Combined data on the equipment and output of central electric stations and electric railways.—While, from time to time, attention has been called to the United

States totals which include both street railways and central stations, it may be of some interest to the reader here to sum up in tabular form the combined figures for equipment and output for states and divisions as well as for the United States at the last three census periods.

After the detailed analyses which have already been made of the figures relating to the primary power equipment, together with the dynamos and output of central stations, it is probably unnecessary to make extended comment on Table 60, in which totals are assembled. Attention should, however, be called to the states and divisions which in 1917 stood highest in generating capacity and output when the street railway industry was added to the central station industry.

COMPARATIVE SUMMARY—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—PRIMARY POWER, DYNAMO CAPACITY, AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

Table 60	DIVISION AND STATE.	Cen- sus year.	PRIMARY POWER.						KILOWATT CAPACITY OF DYNAMOS.			Total kilowatt hours generated.	
			Total horse- power.	Steam engines and steam turbines.		Internal-combus- tion engines.		Water wheels.		Total.	Direct current.		Alternat- ing current.
				Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.				
	UNITED STATES.....	1917	17,136,947	9,228	11,992,991	2,987	238,700	3,690	4,905,256	11,919,186	968,723	10,950,463	32,678,806,061
		1912	11,191,429	10,105	8,115,666	1,164	135,225	3,322	2,940,538	7,670,755	1,243,385	6,427,390	17,571,768,921
		1907	6,618,011	11,422	5,104,800	504	72,163	2,709	1,441,048	4,432,641	1,428,954	3,003,687	10,621,406,837
	GEOGRAPHIC DIVISIONS:												
	New England.....	1917	1,788,740	755	1,388,712	47	5,605	616	394,423	1,272,322	160,837	1,111,485	2,642,446,330
		1912	1,157,132	885	903,604	55	10,017	572	243,511	820,628	210,017	610,611	1,541,921,385
		1907	718,499	1,126	566,829	39	6,823	520	144,847	501,427	240,673	260,754	1,015,385,019
	Middle Atlantic.....	1917	4,430,374	1,580	3,508,290	190	31,819	602	890,265	3,069,676	258,521	2,811,155	9,331,673,441
		1912	2,991,020	1,961	2,291,573	192	33,939	595	665,508	2,047,134	340,876	1,706,258	5,371,253,169
		1907	1,927,114	2,478	1,561,260	118	17,137	532	348,717	1,338,048	449,593	888,455	3,679,460,449
	East North Central.....	1917	3,866,479	2,280	3,363,517	457	31,893	799	471,079	2,743,769	247,916	2,495,853	7,532,355,405
		1912	2,515,706	2,627	2,183,091	224	26,710	703	305,905	1,784,368	342,488	1,441,880	3,995,158,144
		1907	1,473,949	3,137	1,318,501	123	12,725	610	142,723	976,419	371,929	604,490	2,343,163,832
	West North Central.....	1917	1,503,933	1,548	1,080,850	1,383	77,414	317	345,669	1,077,751	97,767	979,984	2,454,144,137
		1912	929,220	1,513	766,922	424	29,578	272	132,720	641,343	113,222	528,121	1,209,359,546
		1907	577,054	1,538	468,027	97	7,336	200	101,691	379,206	113,895	265,311	786,641,429
	South Atlantic.....	1917	1,675,063	960	921,496	152	23,212	417	730,355	1,119,602	64,170	1,055,432	2,587,663,188
		1912	1,004,038	945	587,888	60	11,373	385	404,777	682,325	79,616	602,709	1,074,027,912
		1907	552,496	950	374,427	31	6,520	266	171,549	376,195	89,764	277,431	643,771,881
	East South Central.....	1917	666,725	634	427,152	119	4,680	81	234,893	476,037	47,924	428,113	1,252,280,629
		1912	354,338	616	315,628	13	1,080	47	37,630	241,347	48,286	193,061	476,150,487
		1907	218,799	603	210,492	3	60	29	8,247	147,736	43,924	103,812	298,426,946
	West South Central.....	1917	494,454	851	438,461	474	48,732	41	7,261	352,371	46,502	305,869	788,185,132
		1912	344,799	890	318,767	153	17,354	35	8,678	242,617	48,608	194,009	425,302,675
		1907	206,039	813	199,287	59	3,690	24	3,062	136,856	51,604	85,252	258,425,302
	Mountain.....	1917	861,222	324	228,287	123	11,940	371	620,995	574,432	13,909	560,523	2,135,949,169
		1912	516,451	303	179,217	20	2,695	310	334,539	317,176	17,069	300,087	980,641,612
		1907	261,597	337	112,244	13	855	231	148,498	175,220	22,677	152,543	446,471,639
	Pacific.....	1917	1,849,957	296	636,226	42	3,415	446	1,210,316	1,233,226	31,177	1,202,049	3,954,108,630
		1912	1,378,725	365	568,976	23	2,479	403	807,270	893,817	43,163	850,654	2,497,963,991
		1907	682,464	440	293,733	21	17,017	297	371,714	410,534	44,895	365,639	1,149,680,340
	NEW ENGLAND:												
	Maine.....	1917	143,796	80	36,846	7	180	219	106,770	86,066	7,060	78,976	227,101,065
		1912	129,773	89	34,136	3	135	199	95,502	89,991	17,387	72,604	171,241,221
		1907	78,225	115	31,459	.....	.....	164	46,766	52,947	14,755	38,192	95,270,975
	New Hampshire.....	1917	97,313	51	36,194	11	1,228	108	59,891	68,235	3,961	64,274	165,947,288
		1912	88,330	64	27,306	11	1,905	117	59,119	60,503	4,796	55,707	131,950,020
		1907	50,414	70	23,095	8	1,115	103	26,204	34,637	6,112	28,525	58,209,739
	Vermont.....	1917	82,154	33	17,485	1	50	123	64,619	59,478	1,917	57,561	76,661,434
		1912	58,018	54	17,996	2	95	120	39,927	36,212	3,372	32,840	49,527,559
		1907	44,016	50	12,589	4	205	107	31,222	26,729	4,776	21,953	34,066,513
	Massachusetts.....	1917	1,015,075	399	886,792	18	2,187	102	126,096	712,552	112,694	599,858	1,474,165,620
		1912	623,576	467	591,515	27	5,872	70	26,189	450,236	136,786	313,450	838,789,192
		1907	387,422	620	365,216	17	3,797	73	18,409	275,116	154,537	120,579	589,133,532
	Rhode Island.....	1917	191,171	33	186,308	5	1,125	17	3,738	147,117	7,100	140,017	236,771,687
		1912	95,349	37	91,784	5	1,125	13	2,440	70,109	13,959	56,150	124,222,051
		1907	57,071	70	53,808	4	1,000	16	2,263	41,840	23,681	18,159	93,410,987
	Connecticut.....	1917	259,231	159	225,087	5	835	47	33,309	198,884	28,085	170,799	461,779,216
		1912	162,066	174	140,867	7	885	53	20,334	113,577	33,717	79,860	226,191,342
		1907	101,351	201	80,662	6	706	57	19,983	70,158	36,812	33,346	145,303,273

COMPARATIVE SUMMARY—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—PRIMARY POWER, DYNAMO CAPACITY, AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907—Contd.

Table 60—Continued.		PRIMARY POWER.								KILOWATT CAPACITY OF DYNAMOS.			Total kilowatt hours generated.
DIVISION AND STATE.	Cen- sus year.	Total horse- power.	Steam engines and steam turbines.		Internal-combus- tion engines.		Water wheels.		Total.	Direct current.	Alternat- ing current.		
			Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.					
MIDDLE ATLANTIC:													
New York.....	1917	2,502,992	677	1,772,619	78	8,543	455	721,830	1,730,093	112,729	1,617,364	5,062,699,030	
	1912	1,812,529	781	1,273,422	76	9,186	436	530,921	1,216,336	140,143	1,076,193	3,374,099,343	
	1907	1,139,804	912	819,079	32	5,200	386	315,435	793,446	226,994	566,452	2,420,974,919	
New Jersey.....	1917	386,709	207	381,837	26	3,545	12	1,327	264,071	42,269	221,802	804,126,066	
	1912	268,612	296	264,683	21	2,360	18	1,569	203,209	49,560	153,649	417,089,681	
	1907	185,537	335	182,415	11	1,328	22	1,794	137,298	48,866	88,432	318,320,064	
Pennsylvania.....	1917	1,540,673	696	1,353,834	86	19,731	135	167,108	1,075,512	103,523	971,989	3,444,888,345	
	1912	908,879	884	753,468	95	22,393	141	133,018	627,589	151,173	476,416	1,589,104,145	
	1907	601,773	1,231	559,766	75	10,519	124	31,488	407,304	173,733	233,571	940,166,466	
EAST NORTH CENTRAL:													
Ohio.....	1917	1,101,823	648	1,068,839	121	12,268	47	20,726	758,522	107,648	650,874	2,088,623,094	
	1912	670,847	787	648,155	95	11,502	38	10,690	477,903	136,640	341,263	1,011,186,644	
	1907	415,266	899	406,091	55	5,878	26	3,287	282,182	126,946	155,236	667,104,385	
Indiana.....	1917	470,033	446	439,102	46	3,268	90	27,663	353,087	22,424	330,663	729,628,699	
	1912	307,423	446	281,468	19	2,040	90	23,915	228,748	26,610	202,138	454,911,393	
	1907	196,967	507	176,066	15	1,295	83	19,606	136,666	35,890	100,776	274,796,437	
Illinois.....	1917	1,194,108	587	1,125,337	119	4,661	105	64,110	841,096	60,872	780,224	2,467,354,650	
	1912	820,411	691	774,807	35	3,042	105	42,562	604,288	112,163	492,125	1,549,487,964	
	1907	497,492	974	484,991	19	870	86	11,631	334,045	138,379	195,666	943,581,414	
Michigan.....	1917	679,047	309	472,458	77	3,074	318	203,515	500,853	25,525	475,328	1,619,093,810	
	1912	445,462	389	300,382	27	1,626	262	134,454	291,535	31,811	259,724	649,339,814	
	1907	241,062	440	154,711	11	603	249	85,738	139,638	37,428	102,210	318,743,484	
Wisconsin.....	1917	421,468	290	257,781	94	8,622	239	155,065	290,211	31,447	258,764	627,655,182	
	1912	272,063	314	196,279	48	8,500	208	94,284	181,894	35,264	146,630	350,232,329	
	1907	123,182	317	96,642	23	4,079	166	22,461	83,888	33,286	50,602	138,989,112	
WEST NORTH CENTRAL:													
Minnesota.....	1917	350,741	256	219,001	148	8,092	108	123,648	254,254	10,999	243,255	593,401,866	
	1912	261,694	262	154,767	54	4,755	124	102,172	173,070	17,922	155,148	375,281,155	
	1907	173,055	267	89,691	22	1,428	83	81,936	113,434	18,672	94,762	189,029,616	
Iowa.....	1917	364,379	338	189,260	158	7,251	95	167,878	253,697	20,110	233,587	768,101,027	
	1912	123,593	374	123,906	52	2,658	58	7,029	96,210	28,172	68,038	150,640,398	
	1907	79,089	369	74,692	11	564	44	3,833	56,078	27,379	28,699	79,979,727	
Missouri.....	1917	362,268	348	336,298	174	7,295	12	18,665	267,368	34,793	232,575	567,419,311	
	1912	308,035	371	303,661	22	2,472	5	1,902	214,931	42,199	172,732	500,619,707	
	1907	202,938	452	199,973	13	963	5	2,002	129,572	41,713	87,859	375,903,548	
North Dakota.....	1917	29,079	117	24,679	157	4,400	.....	.....	20,041	7,249	12,792	22,978,006	
	1912	16,249	75	15,831	8	318	.....	.....	11,024	4,807	6,217	12,334,553	
	1907	10,527	61	10,222	2	205	1	100	6,093	4,063	2,030	8,261,885	
South Dakota.....	1917	33,126	57	16,150	178	10,006	11	6,970	24,323	2,913	21,410	31,810,487	
	1912	27,748	50	16,003	86	4,832	15	6,913	20,032	2,492	17,540	24,703,754	
	1907	12,984	52	10,251	10	528	12	2,206	10,046	1,488	8,558	13,615,015	
Nebraska.....	1917	139,766	199	115,282	284	13,980	87	10,504	98,702	11,243	87,459	178,772,645	
	1912	71,293	168	61,577	91	8,832	44	5,884	48,011	8,985	39,026	95,169,030	
	1907	42,102	154	38,303	17	845	19	2,964	28,041	9,655	18,386	52,026,421	
Kansas.....	1917	224,584	273	180,190	284	26,390	34	18,004	154,366	10,460	143,906	291,690,806	
	1912	110,608	213	91,077	111	10,711	26	8,820	78,065	8,645	69,420	150,610,949	
	1907	56,359	183	44,895	22	2,803	36	8,661	35,942	10,925	25,017	67,825,217	
SOUTH ATLANTIC:													
Delaware.....	1917	34,707	28	34,060	1	22	5	625	20,997	2,798	18,199	52,400,045	
	1912	24,901	42	23,825	3	250	8	826	16,095	4,975	11,120	25,840,778	
	1907	14,800	47	14,515	.....	.....	5	285	12,408	7,767	4,641	12,238,788	
Maryland.....	1917	167,067	78	163,467	17	1,215	19	2,405	119,533	11,552	107,981	229,165,814	
	1912	125,638	112	121,592	8	823	25	3,223	91,364	16,077	75,287	167,588,346	
	1907	118,531	150	117,054	5	130	13	1,347	74,708	17,963	56,745	153,451,176	
District of Columbia.....	1917	120,690	22	120,690	.....	.....	.....	.....	68,350	5,350	63,000	170,286,766	
	1912	77,230	24	77,230	.....	.....	.....	.....	57,058	8,458	48,600	116,923,803	
	1907	38,290	42	38,290	.....	.....	.....	.....	27,727	8,627	19,100	66,006,336	
Virginia.....	1917	212,566	125	136,871	22	821	91	74,874	151,202	14,518	136,684	318,007,783	
	1912	160,489	125	93,905	3	185	92	66,399	116,496	12,040	104,456	145,024,065	
	1907	82,482	138	55,046	5	960	99	26,476	65,961	21,112	44,849	94,939,273	
West Virginia.....	1917	165,735	116	146,936	33	12,300	15	6,499	127,246	12,155	115,091	290,968,487	
	1912	68,925	132	59,804	24	3,085	14	6,036	49,767	11,990	37,787	102,198,976	
	1907	42,891	118	37,989	12	1,275	11	3,627	31,294	9,869	21,425	64,729,936	
North Carolina.....	1917	254,671	132	80,303	19	2,111	89	172,257	171,545	2,351	169,194	400,214,590	
	1912	93,713	118	31,882	5	1,680	76	60,151	61,389	4,059	57,330	88,701,305	
	1907	33,108	116	20,296	.....	.....	52	12,812	23,746	4,317	19,429	33,969,179	
South Carolina.....	1917	300,590	93	49,009	13	482	90	251,099	185,005	2,292	182,713	541,309,883	
	1912	230,066	84	51,596	3	455	88	178,555	140,986	4,878	136,108	365,575,958	
	1907	108,781	86	20,111	1	150	58	83,470	64,668	3,373	61,290	96,312,449	
Georgia.....	1917	326,917	202	107,913	18	3,518	95	215,486	213,612	7,316	206,296	503,320,362	
	1912	170,832	195	84,625	5	8,720	71	82,487	112,841	9,976	102,865	142,082,277	
	1907	93,380	155	48,108	2	3,140	50	42,132	60,488	11,494	48,944	94,637,017	
Florida.....	1917	92,100	164	82,247	29	2,743	13	7,110	62,112	5,838	56,274	81,999,538	
	1912	51,704	113	43,429	9	1,175	11	7,100	36,329	7,173	29,156	50,922,414	
	1907	25,283	98	23,018	6	865	8	1,400	16,260	5,242	11,018	27,487,727	

OUTPUT AND DISPOSAL OF CURRENT.

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COMPARATIVE SUMMARY—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—PRIMARY POWER, DYNAMO CAPACITY, AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907—Contd.

Table 60—Continued.		PRIMARY POWER.								KILOWATT CAPACITY OF DYNAMOS.			Total kilowatt hours generated.
DIVISION AND STATE.	Cen- sus year.	Total horse- power.	Steam engines and steam turbines.		Internal-combus- tion engines.		Water wheels.		Total.	Direct current.	Alternat- ing current.		
			Num- ber.	Horse- power.	Num- ber.	Horse- power.	Num- ber.	Horse- power.					
EAST SOUTH CENTRAL:													
Kentucky.....	1917	140,462	184	137,776	63	2,301	7	385	100,067	15,471	84,596	193,887,625	
	1912	108,227	183	107,651	6	576			69,867	16,149	53,718	149,406,553	
	1907	71,409	192	71,394	1	15			48,210	17,429	30,781	90,656,286	
Tennessee.....	1917	255,445	156	123,162	19	681	56	121,662	183,540	13,646	169,894	655,596,681	
	1912	122,361	164	94,166	4	445	23	27,750	85,690	15,213	70,477	157,305,115	
	1907	68,385	165	67,145			14	1,240	46,718	11,922	34,796	98,496,291	
Alabama.....	1917	221,466	144	117,984	8	705	18	102,856	156,909	14,981	141,928	352,275,905	
	1912	83,403	122	73,504	2	19	15	9,890	57,277	13,967	43,310	131,557,661	
	1907	52,619	114	45,592	1	20	15	7,007	36,024	11,542	24,482	78,964,858	
Mississippi.....	1917	49,328	150	43,280	29	1,043			35,821	3,826	31,995	50,520,468	
	1912	40,347	142	40,307	1	40			28,513	2,957	25,556	37,879,156	
	1907	26,386	132	26,361	1	25			16,784	3,081	13,703	30,315,516	
WEST SOUTH CENTRAL:													
Arkansas.....	1917	53,249	144	48,148	44	2,561	10	2,540	37,370	11,854	25,516	71,725,478	
	1912	42,604	134	39,843	5	221	10	3,040	30,442	6,610	23,832	42,625,641	
	1907	24,494	125	24,182	1	12	1	300	17,012	5,714	11,298	27,867,049	
Louisiana.....	1917	95,864	108	88,867	74	6,997			66,890	15,583	51,307	158,471,436	
	1912	70,910	118	69,920	9	980			52,059	21,372	30,687	104,561,816	
	1907	66,728	171	66,306	3	420			41,678	23,865	17,813	93,441,254	
Oklahoma.....	1917	97,312	231	82,684	137	13,260	5	1,368	67,323	4,265	63,058	121,222,945	
	1912	63,597	204	55,196	39	6,266	7	2,135	45,981	4,895	41,086	65,217,868	
	1907	24,423	117	24,228	2	200			16,999	3,420	13,579	26,963,403	
Texas.....	1917	248,029	373	213,762	219	25,914	26	3,353	180,788	14,800	165,988	436,765,273	
	1912	167,688	434	154,306	100	9,877	18	3,503	114,185	15,731	98,454	212,867,349	
	1907	90,399	400	84,579	53	3,068	23	2,762	61,167	18,605	42,562	110,123,596	
MOUNTAIN:													
Montana.....	1917	279,004	39	3,684	39	1,408	78	268,917	182,079	1,852	180,227	965,453,777	
	1912	117,320	39	13,500	1	75	67	103,655	75,468	2,705	72,763	381,012,617	
	1907	69,967	33	12,980			62	56,967	40,402	3,210	37,192	137,379,261	
Idaho.....	1917	56,422	10	2,650	4	148	71	53,624	37,108	99	37,004	145,307,596	
	1912	56,375	14	4,525			68	51,850	35,656	126	35,530	115,812,292	
	1907	13,694	19	2,202			37	11,492	7,062	147	6,915	9,577,588	
Wyoming.....	1917	27,462	58	22,637	23	1,987	12	2,688	20,627	662	19,965	27,391,551	
	1912	11,586	45	10,162	1	100	11	1,334	8,212	1,077	7,135	11,580,567	
	1907	5,125	34	4,360			6	765	3,203	1,006	2,205	5,499,064	
Colorado.....	1917	196,148	131	121,206	11	527	66	76,415	124,561	9,996	124,565	372,451,450	
	1912	180,266	119	99,831	1	80	69	80,355	101,360	10,241	91,119	263,111,504	
	1907	104,217	164	76,457	4	300	52	27,460	66,764	14,104	52,660	166,385,826	
New Mexico.....	1917	17,106	37	13,226	22	3,262	7	630	12,713	986	11,727	17,244,768	
	1912	11,015	32	8,428	9	1,770	9	817	7,981	876	7,105	9,027,824	
	1907	5,728	30	5,215			6	513	4,894	1,665	3,229	5,519,914	
Arizona.....	1917	39,651	29	24,895	16	4,066	4	11,200	27,637	300	27,337	67,268,712	
	1912	22,675	35	13,375			4	9,300	15,151	991	14,160	33,645,484	
	1907	7,746	32	6,926	3	70	4	750	5,063	901	4,162	9,611,342	
Utah.....	1917	226,565	15	34,189			112	192,406	147,359	64	147,295	486,966,136	
	1912	101,874	13	27,186			74	74,688	62,835	735	62,100	121,481,552	
	1907	48,140	21	3,989			55	44,271	42,117	1,567	40,520	83,876,892	
Nevada.....	1917	16,892	5	1,100	8	617	21	15,115	12,353		12,353	53,846,178	
	1912	15,420	6	2,210	8	670	13	12,540	10,513		10,175	44,966,772	
	1907	6,980	4	235	6	485	9	6,280	5,690		5,690	29,621,730	
PACIFIC:													
Washington.....	1917	426,262	70	74,389	16	600	120	350,273	273,035	10,755	262,280	899,319,676	
	1912	341,701	83	71,895	3	165	107	269,641	209,913	10,806	199,105	510,822,535	
	1907	109,661	114	48,553	2	90	51	61,018	94,967	12,869	82,118	263,302,190	
Oregon.....	1917	182,656	58	61,012	15	578	104	121,066	112,797	4,420	108,377	325,973,288	
	1912	155,465	72	49,829	9	334	88	105,302	71,156	5,249	65,907	228,398,346	
	1907	126,815	66	24,581	6	182	72	102,052	32,667	3,967	28,710	92,880,992	
California.....	1917	1,142,089	159	500,825	11	2,237	222	738,977	847,394	16,002	831,392	2,758,815,666	
	1912	881,559	210	447,252	11	1,980	208	432,327	612,748	27,106	585,642	1,758,733,110	
	1907	445,988	260	220,599	13	16,745	174	208,644	282,880	28,069	254,811	773,477,158	

Six divisions reported a total of more than 1,000,000 horsepower in 1917—the Middle Atlantic (4,430,374), East North Central (3,866,479), Pacific (1,849,957), New England (1,788,740), South Atlantic (1,675,063), and West North Central (1,503,933). The leading states in 1917, so far as primary power is concerned, were New York (2,502,992 horsepower), Pennsylvania (1,540,673), California (1,242,039), Illinois (1,194,108), Ohio (1,101,823), and Massachusetts

(1,015,075). Those divisions which led in total primary power reported were also first in the matter of generating equipment, though not always in the same order—Middle Atlantic (3,069,676 kilowatts), East North Central (2,743,769), New England (1,272,322), Pacific (1,233,226), South Atlantic (1,119,602), and West North Central (1,077,751). The fact that the Pacific and the New England divisions have their positions reversed from that which

they held in primary horsepower probably indicates that in these Western states, particularly in California, there is a good deal of water horsepower in process of development. Those states which led in dynamo capacity are New York (1,730,093 kilowatts), Pennsylvania (1,075,512), California (847,394), Illinois (841,096), Ohio (758,522), Massachusetts (712,552), and Michigan (500,853). No other states approach near these in kilowatt capacity reported.

Finally, attention should be called to the total number of kilowatt hours generated. In this respect the various divisions group themselves pretty much in the same order as for generating equipment, the Middle Atlantic leading, with 9,331,673,441 kilowatt hours, followed by the East North Central (7,532,355,405 kilowatt hours), the Pacific (3,954,108,630), New England (2,642,446,330), South Atlantic (2,587,663,188), West North Central (2,454,144,137), and Mountain (2,135,949,169). The other divisions reported much smaller amounts. Evidently the central sta-

tions in the Pacific division, which, while reporting slightly less generating capacity than the New England division, have produced almost 50 per cent more current, are operating under much more satisfactory conditions. It is not always possible to determine from the generating capacity reported what amount of current will be produced in the different states. New York, however, naturally stands first, with 5,082,659,030 kilowatt hours, followed by Pennsylvania, with 3,444,888,345 kilowatt hours. Next come California (2,758,815,666 kilowatt hours), Illinois (2,467,354,650), Ohio (2,088,623,094), Michigan (1,619,093,810), Massachusetts (1,474,165,620), Montana (965,453,777), Washington (869,319,676), New Jersey (804,126,066), Iowa (768,101,027), Indiana (729,628,669), Tennessee (655,596,631), Wisconsin (627,655,182), Minnesota (593,401,856), Missouri (567,419,311), South Carolina (541,309,833), and Georgia (503,320,362).

CHAPTER VII.—LINE EQUIPMENT, SUBSTATION EQUIPMENT, AND CUSTOMERS.

Nature of the statistics.—In this census statistics were secured regarding the substation and subsidiary equipment, such as rotary converters and motor generator sets, boosters, transformers, and storage batteries. But more attention has been given to the number of street lamps of all kinds, stationary motors served, and number of meters and customers. Special effort has already been made to work out certain significant relations between the population of the districts served by commercial and municipal plants, and the number of customers, amount of service per customer, etc.

In previous years an attempt was made to secure the estimated number of customers' lamps wired for service, but, in view of the fact that the data collected, while having a certain general interest, were open to serious question, being, in the main, rather rough estimates, it was thought best not to collect these statistics in 1917. There are also many other features of line equipment regarding which it would be interesting, for certain purposes, to have conclusive data, as, for example, the number of miles of wire, length of conduits and cables therein, and the number of poles and line transformers. In 1902 and 1907 some very unsatisfactory attempts were made to secure such data, and in 1912 the effort was discontinued.

Street lamps.—For the purposes of this census, in accordance with the practice of 1912, street lamps have been classified merely as "arc," "incandescent," and "other varieties." A few words of explanation, however, may be in order. Arc lamps are of several kinds: First, the old carbon arc, now practically out of use, which may be of the open or inclosed type, and which has a very low degree of efficiency, that is, it consumes a high amount of electric current in proportion to the candlepower of light produced; secondly, there is the so-called flaming arc, which may also be "open" or "inclosed," the light production of which depends upon the luminescence of carbon, impregnated with certain mineral salts; and finally, there is the so-called magnetite arc, a lamp of the highest efficiency, the electrodes of which consist of copper and a tube packed with magnetite and other minerals. No figures were secured showing the relative use of these different kinds of arcs.

Under "Incandescent lamps" are really included only the commoner kinds of incandescents—the "vacuum" type—namely, the carbon, gem or metalized carbon, tantalum, and tungsten, or mazda, as it is sometimes commercially called. Of these types the "carbon filament," which was the earlier invention, has been used in rapidly decreasing proportions for

the last 10 or 12 years, because of its relatively low efficiency, until at the present time it is practically supplanted by the tungsten or occasionally by the gem. The tantalum lamp has never been of much commercial importance.

Under "Other varieties" are included those types of incandescents which are sometimes referred to as "gas filled," as contrasted with the "vacuum" lamps, above referred to, and Nernst lamps. Under this head the nitrogen-filled tungsten lamp of unusually high efficiency is most common, while the Nernst, the luminous element of which consists of a glower of refractory earth oxide operating in the atmosphere, has practically passed out of use, as its efficiency is much inferior to that of the metal filament lamps; and finally, this class also includes the different varieties of mercury-vapor arc lamps, in which the light is emitted entirely from luminous conducting vapors arising from the action of electric current on mercury electrodes. However, so far as street lamps are concerned, it is probable that practically all, if not all, the data returned under this head are for nitrogen-filled lamps.

Table 61 (p. 94) shows the relative growth for the entire central electric station industry in the United States in certain items of the line equipment since 1907. For the sake of completeness some data covering the electric station operations of those street railways which could not furnish complete separate reports have been included.

The number of street lamps was not reported either by the central electric stations or the electric railways in 1907, and in 1912 and 1917 the electric railways did not report the number and horsepower of stationary motors served or the number of customers' meters. Hence this table is significant merely to the extent that it shows the *actual* number of street lamps in use during 1912 and 1917. In passing, however, it is interesting to note that there has been an increase in the importance of the street lighting business done by the central station departments of electric railways. In 1917 this group of street railways reported over 11 per cent of the total number of street arcs, more than 12 per cent of incandescent lamps, and nearly 22 per cent of "other varieties," whereas in 1912 the proportions were over 9 per cent for arcs, a little more than 5 per cent for incandescents, and for "other varieties" 59 per cent. The total number of lamps of other varieties reported in 1912, 1,409, was, to be sure, almost negligible, and such lamps are at the present time of relatively small importance, since they comprise only three-fifths of 1 per cent of the total number of street lamps.

Table 61

CENTRAL ELECTRIC STATIONS AND STATIONS OPERATED IN CONNECTION WITH ELECTRIC RAILWAYS—LINE EQUIPMENT: 1917, 1912, AND 1907.						
	Number of street lamps.			Stationary motors served.		Number of meters on consumption circuits
	Arc.	Incandescent.	Other varieties—Nernst, vapor, etc.	Number.	Horsepower.	
Total:						
1917.....	239,439	1,577,589	11,573	555,924	9,216,330	7,102,569
1912.....	335,067	719,631	1,409	435,473	4,130,619	3,617,189
1907.....	(¹)	(¹)	(¹)	187,652	1,807,949	1,897,803
Central stations:						
1917.....	256,960	1,383,219	9,065	555,924	9,216,330	7,102,569
1912.....	348,643	681,379	578	435,473	4,130,619	3,617,189
1907.....	(¹)	(¹)	(¹)	167,184	1,649,026	1,683,917
Electric railways:						
1917.....	32,489	194,361	2,508	(²)	(²)	(²)
1912.....	36,414	38,252	831	(²)	(²)	(²)
1907.....	(¹)	(¹)	(¹)	20,468	158,923	213,886
PER CENT OF INCREASE.³						
Total:						
1907-1917.....				193.2	409.8	274.2
1912-1917.....	-24.8	119.2	721.4	27.6	123.1	96.4
1907-1912.....				132.1	128.5	90.6
Central stations:						
1907-1917.....				232.5	458.9	321.8
1912-1917.....	-26.3	103.0	1,468.3	27.6	123.1	96.4
1907-1912.....				100.5	150.6	114.8
Electric railways:						
1907-1917.....	-10.9	408.1	201.8			
1912-1917.....						
1907-1912.....						

¹ Figures not available.² Not reported.³ A minus sign (-) denotes decrease.

In Table 62 are given comparative statistics of line equipment for commercial and municipal stations for 1917, 1912, and 1907. From these data it can be seen that the total number of arc lamps has decreased 26.3 per cent since 1912. The rate of decrease, however, has been almost twice as rapid for the municipal as for the commercial stations. The number of incandescent lamps has a little more than doubled during the five-year period for both groups of stations, and, while there has been a very rapid rate of increase in "other varieties" of lamps, their relative importance, as above indicated, is negligible. Comparatively, however, it is highly significant that, while the arc lamps formed 33.8 per cent of all street lamps in 1912, in 1917 the proportion had dropped to 15.6 per cent. Mention should also be made of the fact that, while in 1917 municipal plants reported 28.7 per cent of all street lamps in that year, they served only 13.6 per cent of the total number of customers. The proportions were little different for 1912. Hence it would appear, from these figures alone, that the municipal plants are still stressing their street lighting business very heavily and that municipalities in general are probably more liberal in supplying themselves with street light by means of plants owned by themselves than when it is necessary to purchase current from other companies.

General comparisons.—A considerable amount of difficulty was experienced in collecting the statistics covering the number and horsepower of stationary motors which are expected to include all motors connected with the power circuits of central electric stations. Small fan motors and those of street railways

were, of course, not included. Many large plants, however, because of the extent and nature of business in their districts, found it practically impossible to return, with any degree of accuracy, the number of stationary motors served, even though they were able to give a fair estimate of their total connected horsepower. Hence the statistics for 1917, as well as for earlier years, are not wholly complete, though they do indicate with a reasonable degree of accuracy the development of this phase of the industry. The details of this matter are discussed in connection with Tables 64 and 65.

At any rate, the increase both in number and horsepower of motors has been, during the last decade and during the five-year period 1912-1917, much more rapid for the municipal than for the commercial plants. This greater increase, however, has been due largely to the fact that in 1907 the municipal stations did practically no power business, and even in 1917 they returned a relatively small proportion of the total horsepower for all central electric stations, 4.6 per cent. On the other hand, municipal plants report 9.2 per cent of the total number of motors. These figures indicate in a rough sort of way that the average horsepower of motors for the municipal plants is much smaller than that for the commercial plants. It is highly significant that, while the number of motors reported for commercial plants increased only 22.1 per cent between 1912 and 1917, their total horsepower increased 121.6 per cent, while for municipal stations the increase in number was at the rate of 133.2 per cent, with an increase in horsepower of 159.1 per cent.

Table 62

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—LINE EQUIPMENT: 1917, 1912, AND 1907.							
CLASS OF STATIONS.	Number of street lamps.			Stationary motors served.		Number of meters on consumption circuits.	Number of customers.
	Arc.	Incandescent.	Other varieties—Nernst, vapor, etc.	Number.	Horsepower.		
Total:							
1917.....	256,950	1,383,219	9,065	555,924	9,216,330	7,102,569	7,178,708
1912.....	248,643	681,379	578	435,473	4,130,619	3,617,189	3,537,518
1907.....	(¹)	(¹)	(¹)	167,184	1,649,026	1,683,917	1,946,979
Commercial:							
1917.....	206,957	962,908	6,801	504,864	8,790,707	6,172,436	6,202,189
1912.....	204,152	474,048	440	413,578	3,966,328	3,146,986	3,111,870
1907.....	(¹)	(¹)	(¹)	162,877	1,617,337	1,408,763	1,668,354
Municipal:							
1917.....	49,993	420,311	2,264	51,060	425,623	930,133	976,514
1912.....	84,491	207,331	138	21,895	164,291	470,191	525,848
1907.....	(¹)	(¹)	(¹)	4,507	31,689	215,154	283,625
PER CENT OF INCREASE. ²							
Total:							
1907-1917.....	-26.3	103.0	1,468.3	232.5	458.9	321.8	268.7
1912-1917.....				27.6	123.1	96.4	87.1
1907-1912.....				160.5	150.5	114.8	97.1
Commercial:							
1907-1917.....				210.3	443.5	320.2	272.9
1912-1917.....	-21.7	103.1	1,445.7	22.1	121.6	96.1	87.3
1907-1912.....				154.2	145.2	114.3	99.1
Municipal:							
1907-1917.....				1,032.9	1,243.1	332.3	244.8
1912-1917.....	-40.8	102.7	1,540.6	133.2	159.1	97.8	85.8
1907-1912.....				385.8	418.4	118.5	85.3

¹ Figures not available.² A minus sign (-) denotes decrease.

The number of customers' meters reported did not at earlier periods necessarily bear any close relation to the number of customers. Many small stations, even at the present time, sell their current on a "flat rate," not deeming it worth their while to go to the expense of providing meters. This is particularly true in the case of municipal plants. Further, in some cases a customer will have more than one meter, though, as is to be expected, at all periods the total number of customers was considerably in excess of the number of meters. The slightly more rapid rate of increase in the meters of municipal plants (332.3 per cent) than the rate of increase in commercial plants (320.2 per cent) is accounted for by the fact that since 1907 the municipal plants, relative to the number of customers served, were much less adequately supplied with meters. During the decade the increase in the number of customers has been somewhat more rapid at all periods for the commercial plants, though, as has been pointed out in a previous chapter, the number of such plants increased much less rapidly. Finally, the proportion which the customers of municipal plants bears to the total number of customers reported has remained practically unchanged since 1912, at 13.7 per cent, while in 1907 the ratio was 14.6 per cent.

Table 63 shows, in somewhat more detail, for the different divisions and states, the relative importance of commercial and municipal arc and incandescent street lamps. Before discussing these details, however, some attention should be given to the decreased importance of arc lamps in street lighting, as previously mentioned. Thirty-three and eight-tenths per cent of all street lamps were arcs in 1912, whereas in 1917 the proportion had dropped to 15.6 per cent, and no doubt the decrease will continue from year to year. The tungsten and nitrogen-filled incandescents, due

in part to their superior efficiency and lower cost of maintenance, but more particularly on account of the greater flexibility of this type of street lighting, have, for economic as well as engineering reasons, displaced the arc lamps. The latter are expensive to install and can be operated with greatest effectiveness only at a high wattage. Hence they would naturally be placed at greater intervals on the public highways, but under such circumstances the needs of the populace are not always so well served. The entire subject of illuminating engineering is technical and complicated, and beyond a doubt the subject of human psychology plays an important part in the matter of street lighting. For example, in order to devise a satisfactory system of lighting for a given municipality or portion thereof, regard must be had to the width and construction of streets and sidewalks, the kind of paving or the color of the same, the height of buildings and the color of the walls must be considered, the height of trees and the density of foliage, the layout of streets—whether they be straight or crooked—the contour of the territory—whether it be level or hilly, etc. In addition, it is necessary to know whether a street is used for residential or business purposes, the nature of the business carried on in different municipalities or in different sections of the same municipality, the general character of the citizens—whether they be native or foreign born; if foreign born, their nationality—and, in some cases, the absence or presence of the liquor traffic may seriously affect the problem. Many other considerations are significant, but from what has been mentioned it should be sufficiently clear that in general incandescent lamps of lower wattage and candlepower can usually be more advantageously placed than the arc lamps for street-lighting purposes.

ELECTRICAL INDUSTRIES: 1917.

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF LAMPS USED FOR STREET LIGHTING, BY GEOGRAPHIC DIVISIONS AND STATES: 1917 AND 1912.

DIVISION AND STATE.	Census year.	NUMBER OF STREET LAMPS.						PER CENT DISTRIBUTION.			
		Arc.			Incandescent. ¹			Arc.		Incandescent.	
		Total.	Reported by—		Total.	Reported by—		Commer- cial.	Municipal.	Commer- cial.	Municipal.
			Commer- cial stations.	Municipal stations.		Commer- cial stations.	Municipal stations.				
UNITED STATES.....	1917	256,950	206,957	49,993	1,383,219	902,908	420,311	80.5	19.5	69.6	30.4
	1912	348,643	264,152	84,491	681,379	474,048	207,331	75.8	24.2	69.6	30.4
GEOGRAPHIC DIVISIONS:											
New England.....	1917	24,484	23,836	648	184,554	153,363	31,191	97.4	2.6	83.1	16.9
	1912	29,633	26,798	2,835	124,142	96,665	27,477	90.4	9.6	77.9	22.1
Middle Atlantic.....	1917	77,396	70,918	6,478	322,557	301,025	21,532	91.6	8.4	98.3	6.7
	1912	109,039	100,889	8,150	126,044	116,765	9,279	92.5	7.5	93.4	6.6
East North Central.....	1917	75,464	45,649	29,815	294,459	147,190	147,269	60.5	39.5	50.0	50.0
	1912	106,688	57,964	48,724	114,419	55,216	59,203	54.3	45.7	48.3	51.7
West North Central.....	1917	16,324	12,504	3,820	209,560	119,869	90,201	76.6	23.4	57.0	43.0
	1912	24,751	18,073	6,678	102,152	69,734	42,418	73.0	27.0	58.5	41.5
South Atlantic.....	1917	13,514	9,586	3,928	87,624	50,197	37,427	70.8	29.2	57.3	42.7
	1912	17,679	9,812	7,867	44,142	27,579	16,563	55.5	44.5	62.5	37.5
East South Central.....	1917	12,098	10,040	2,058	41,023	22,516	18,507	53.0	47.0	54.9	45.1
	1912	15,247	10,766	4,481	18,816	9,755	9,061	70.6	29.4	51.8	48.2
West South Central.....	1917	12,927	10,285	2,642	51,131	31,308	19,823	60.3	39.7	61.2	38.8
	1912	14,326	11,078	3,248	27,063	18,445	8,618	77.3	22.7	68.1	31.9
Mountain.....	1917	9,469	9,255	214	46,698	37,556	9,142	97.7	2.3	80.4	19.6
	1912	8,150	7,879	271	23,317	17,532	5,785	96.7	3.3	75.2	24.8
Pacific.....	1917	15,274	14,804	470	145,613	100,394	45,219	96.9	3.1	68.9	31.1
	1912	23,130	20,903	2,227	102,264	72,357	29,907	90.4	9.6	70.8	29.2
NEW ENGLAND:											
Maine.....	1917	322	268	54	17,908	12,607	5,301	83.2	16.8	70.4	29.6
	1912	1,411	1,094	317	9,539	7,790	1,749	77.5	22.5	79.2	20.8
New Hampshire.....	1917	67	67	0	14,768	13,916	852	100.0	0.0	94.2	5.8
	1912	1,482	1,482	0	9,100	8,584	516	100.0	0.0	94.3	5.7
Vermont.....	1917	356	321	35	9,046	6,489	2,557	90.2	9.8	71.7	28.3
	1912	1,013	709	304	5,563	3,787	1,776	70.0	30.0	68.1	31.9
Massachusetts.....	1917	16,375	15,872	503	100,441	80,087	20,404	96.9	3.1	79.7	20.3
	1912	17,601	15,834	1,767	67,372	53,124	14,248	90.0	10.0	78.9	21.1
Rhode Island.....	1917	2,065	2,065	0	16,202	15,874	328	100.0	0.0	98.0	2.0
	1912	3,068	2,993	75	10,640	10,631	9	97.9	2.1	99.9	0.1
Connecticut.....	1917	5,299	5,243	56	26,189	24,440	1,749	98.9	1.1	93.3	6.7
	1912	5,068	4,696	372	21,628	12,749	8,879	92.5	7.5	58.9	41.1
MIDDLE ATLANTIC:											
New York.....	1917	20,373	19,139	1,234	156,656	149,333	7,323	93.9	6.1	95.3	4.7
	1912	47,391	44,403	2,988	62,706	58,793	3,913	93.7	6.3	93.8	6.2
New Jersey.....	1917	13,480	12,628	852	58,652	50,708	7,944	93.7	6.3	94.5	5.5
	1912	16,052	15,561	491	33,708	32,296	1,410	96.9	3.1	95.8	4.2
Pennsylvania.....	1917	43,543	39,151	4,392	112,249	100,984	11,265	89.9	10.1	90.0	10.0
	1912	45,596	40,925	4,671	28,630	25,674	2,956	89.8	10.2	89.7	10.3
EAST NORTH CENTRAL:											
Ohio.....	1917	23,498	16,358	7,140	49,042	22,940	26,102	69.6	30.4	46.8	53.2
	1912	30,893	21,234	9,659	20,168	6,888	13,280	68.7	31.3	34.2	65.8
Indiana.....	1917	11,610	7,491	4,119	45,917	23,591	22,326	64.5	35.5	51.4	48.6
	1912	14,989	10,077	4,912	19,873	9,560	10,313	67.2	32.8	48.1	51.9
Illinois.....	1917	15,002	11,431	3,571	132,363	59,519	72,844	76.2	23.8	45.0	55.0
	1912	35,399	13,586	21,813	41,066	20,836	20,230	38.4	61.6	50.7	49.3
Michigan.....	1917	18,102	3,801	14,301	41,865	23,492	17,873	21.0	79.0	56.8	43.2
	1912	16,220	5,310	10,910	22,425	11,668	10,757	32.7	67.3	52.1	47.9
Wisconsin.....	1917	7,252	6,588	664	25,772	17,648	8,124	90.6	9.4	68.5	31.5
	1912	9,187	7,747	1,440	10,888	6,255	4,633	84.3	15.7	57.4	42.6
WEST NORTH CENTRAL:											
Minnesota.....	1917	5,565	4,681	884	48,223	28,573	19,650	84.1	15.9	59.3	40.7
	1912	6,495	5,239	1,256	21,776	13,584	8,192	80.7	19.3	62.4	37.6
Iowa.....	1917	2,394	2,126	268	49,706	32,506	17,199	68.8	31.2	65.4	34.6
	1912	3,637	3,066	571	27,479	17,784	9,695	64.3	35.7	64.7	35.3
Missouri.....	1917	4,413	3,530	883	30,101	17,529	12,572	80.0	20.0	58.2	41.8
	1912	6,667	4,785	1,902	16,719	8,603	8,116	71.6	28.4	51.5	48.5
North Dakota.....	1917	497	301	196	11,245	8,508	2,739	60.6	39.4	75.6	24.4
	1912	644	385	259	5,074	3,320	1,754	59.8	40.2	65.4	34.6
South Dakota.....	1917	611	364	247	7,578	5,065	2,513	59.6	40.4	66.8	33.2
	1912	904	627	277	4,362	3,246	1,116	69.4	30.6	74.1	25.9
Nebraska.....	1917	178	151	27	27,538	12,543	14,995	84.8	15.2	45.5	54.5
	1912	2,451	1,910	541	12,149	5,883	6,266	77.9	22.1	48.4	51.6
Kansas.....	1917	2,666	1,351	1,315	36,170	14,637	20,533	50.7	49.3	41.6	58.4
	1912	3,933	2,061	1,872	14,573	7,314	7,259	82.4	17.6	50.2	49.8
SOUTH ATLANTIC:											
Delaware.....	1917	19	19	0	1,461	904	557	100.0	0.0	61.9	38.1
	1912	91	86	5	1,507	850	657	94.5	5.5	56.4	43.6
Maryland.....	1917	4,674	4,635	39	11,736	10,195	1,541	95.1	4.9	86.9	13.1
	1912	4,147	3,474	673	9,276	7,508	1,768	83.8	16.2	80.9	19.1
District of Columbia.....	1917	1,035	1,035	0	9,063	9,063	0	100.0	0.0	100.0	0.0
	1912	1,166	1,166	0	5,626	5,626	0	100.0	0.0	100.0	0.0
Virginia.....	1917	813	324	489	12,783	6,068	6,715	39.9	60.1	47.5	52.5
	1912	2,513	652	1,861	9,369	2,098	2,271	25.9	74.1	48.0	52.0
West Virginia.....	1917	2,151	1,305	846	5,617	5,190	427	60.7	39.3	92.4	7.6
	1912	2,696	1,313	783	2,922	2,826	96	62.6	37.4	96.7	3.3
North Carolina.....	1917	1,545	996	549	11,692	4,391	7,301	62.5	37.5	37.6	62.4
	1912	1,887	835	1,052	5,532	2,045	3,487	44.3	55.7	37.0	63.0

¹ Exclusive of 9,065 street lamps of other varieties in 1917 and 578 in 1912.

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF LAMPS USED FOR STREET LIGHTING, BY GEOGRAPHIC DIVISIONS AND STATES: 1917 AND 1912—Continued.

Table 63—Continued.		NUMBER OF STREET LAMPS.						PER CENT DISTRIBUTION.				
DIVISION AND STATE.		Census year.	Arc.			Incandescent. ¹			Arc.		Incandescent.	
			Total.	Reported by—		Total.	Reported by—		Commer- cial.	Municipal.	Commer- cial.	Municipal.
				Commer- cial stations.	Municipal stations.		Commer- cial stations.	Municipal stations.				
SOUTH ATLANTIC—Continued.												
South Carolina.....	1917	1,348	1,070	278	8,579	3,664	4,915	79.4	20.6	42.7	57.3	
	1912	2,196	1,399	797	2,875	1,380	1,495	63.7	36.3	48.0	52.0	
Georgia.....	1917	480	174	306	14,587	3,005	11,582	36.2	63.8	20.6	79.4	
	1912	2,370	680	1,710	7,283	1,848	5,435	27.8	72.2	25.4	74.6	
Florida.....	1917	1,249	57	1,192	12,076	7,687	4,389	4.6	95.4	63.7	36.3	
	1912	1,213	227	986	4,752	3,398	1,354	18.7	81.3	71.5	28.5	
EAST SOUTH CENTRAL:												
Kentucky.....	1917	6,757	6,343	414	10,832	8,518	2,314	93.9	6.1	78.6	21.4	
	1912	7,332	6,263	1,069	5,278	3,896	1,382	85.4	14.6	73.8	26.2	
Tennessee.....	1917	2,861	1,516	1,345	14,968	8,214	6,754	53.0	47.0	54.9	45.1	
	1912	3,988	1,888	2,050	6,732	3,172	3,560	47.9	52.1	47.1	52.9	
Alabama.....	1917	1,702	1,506	196	6,983	2,520	4,463	88.5	11.5	36.1	63.9	
	1912	2,314	1,652	662	2,805	1,135	1,670	71.4	28.6	40.5	59.5	
Mississippi.....	1917	778	675	103	8,240	3,264	4,976	86.8	13.2	39.6	60.4	
	1912	1,663	963	700	4,001	1,552	2,449	57.9	42.1	38.8	61.2	
WEST SOUTH CENTRAL:												
Arkansas.....	1917	1,138	247	891	9,292	5,945	3,347	21.7	78.3	64.0	36.0	
	1912	1,045	373	672	4,731	2,837	1,894	35.7	64.3	60.0	40.0	
Louisiana.....	1917	4,296	4,290	6	7,266	3,306	3,960	99.9	0.1	45.5	54.5	
	1912	4,474	4,156	318	4,451	2,592	1,859	92.9	7.1	58.2	41.8	
Oklahoma.....	1917	1,925	1,730	195	13,592	6,993	6,599	89.9	10.1	51.4	48.6	
	1912	3,303	2,642	661	8,334	4,699	3,635	80.0	20.0	56.4	43.6	
Texas.....	1917	5,569	4,118	1,451	20,961	15,064	5,917	73.9	26.1	71.8	28.2	
	1912	5,504	3,907	1,597	9,567	8,317	1,250	71.0	29.0	86.9	13.1	
MOUNTAIN:												
Montana.....	1917	1,966	1,827	139	10,658	9,334	1,324	92.9	7.1	87.6	12.4	
	1912	1,560	1,547	13	2,791	2,040	751	99.2	0.8	73.1	26.9	
Idaho.....	1917	924	912	12	6,863	4,978	1,885	96.7	3.3	72.5	27.5	
	1912	1,109	1,024	85	3,886	2,535	1,351	92.3	7.7	65.2	34.8	
Wyoming.....	1917	339	339	0	3,728	3,163	565	100.0	0.0	84.8	15.2	
	1912	396	376	20	1,168	1,059	109	94.9	5.1	90.7	9.3	
Colorado.....	1917	3,272	3,249	23	10,141	8,963	1,178	99.3	0.7	88.4	11.6	
	1912	3,859	3,783	76	7,872	7,073	799	98.0	2.0	89.9	10.1	
New Mexico.....	1917	13	13	0	2,287	2,001	286	100.0	0.0	87.5	12.5	
	1912	247	229	18	627	533	94	92.7	7.3	85.0	15.0	
Arizona.....	1917	430	418	12	4,194	4,125	69	97.2	2.8	98.4	1.6	
	1912	454	454	0	1,335	1,335	0	100.0	0.0	100.0	0.0	
Utah.....	1917	2,511	2,483	28	7,824	4,066	3,758	98.9	1.1	52.2	47.8	
	1912	321	262	59	5,237	2,708	2,529	81.6	18.4	51.7	48.3	
Nevada.....	1917	14	14	0	1,003	906	97	100.0	0.0	90.3	9.7	
	1912	204	204	0	401	251	150	100.0	0.0	62.6	37.4	
PACIFIC:												
Washington.....	1917	1,047	701	346	26,466	5,139	21,327	67.0	33.0	19.4	80.6	
	1912	2,681	1,016	1,665	20,223	4,986	15,237	38.2	61.8	24.7	75.3	
Oregon.....	1917	489	424	65	10,866	8,116	2,750	86.7	13.3	78.3	21.7	
	1912	1,128	1,068	60	6,239	4,721	1,518	94.7	5.3	75.7	24.3	
California.....	1917	18,738	13,679	5,059	108,781	87,139	21,642	99.6	0.4	80.1	19.9	
	1912	19,341	18,819	522	75,802	62,650	13,152	97.3	2.7	82.6	17.4	

¹ Exclusive of 9,065 street lamps of other varieties in 1917 and 578 in 1912.

Commercial plants reported 80.5 per cent of all arcs in 1917, whereas in 1912 their proportion of the total number was 75.8 per cent. Only one division, the Middle Atlantic, shows a slight increase in the percentage distribution of arc lamps for municipal plants since 1912. In this division municipal plants reported 8.4 per cent of all arcs, while at the earlier date they returned only 7.5 per cent. In 12 states, however, the municipal plants show an increase in the percentage distribution of arc lamps. The highest percentage of arcs reported, 39.5 per cent, is found in the East North Central division; but 6 states in 1917—Michigan, Delaware, Virginia, Georgia, Florida, and Arkansas—had more municipal than commercial arcs. Further, in 9 states the number of municipal street arc lamps was greater in 1917 than in 1912, while in 5 states—New Hampshire, Rhode Island,

Wyoming, New Mexico, and Nevada—municipal plants in 1917 reported no arcs whatever. For commercial plants most states naturally show an increase in the percentage of distribution of arc lamps, due to the fact that the decrease in the number of arc lamps was more rapid for the municipal than for the commercial plants. For this group of plants, the Mountain division shows an actual increase, and 9 states return a greater number of commercial arc lamps than in 1912. These are Massachusetts, Connecticut, Maryland, North Carolina, Kentucky, Louisiana, Texas, Montana, and Utah. The state of Delaware had none in 1917.

So far as incandescent lamps are concerned, the municipal stations reported 30.4 per cent of the total in 1917 as in 1912. In one division, the East North Central, they reported as many lamps as did the

commercial stations. There are, however, 12 states in which the number of municipal incandescents exceeds the number reported by the commercial plants. These states are Washington (80.6 per cent), Georgia (79.4 per cent), Ohio, Illinois, Nebraska, Kansas, Virginia, North Carolina, South Carolina, Alabama, Mississippi, and Louisiana. Five divisions, the West North Central, Middle Atlantic, South Atlantic, West South Central, and Pacific, show a small increase in the relative proportion of incandescents reported by municipal plants, while 23 states also report a more or less marked increase in this respect. All states show an absolute increase in the number of incandescent street lamps reported by the commercial stations, and all, except Connecticut, Delaware, Maryland, and Nevada, in the number reported by municipal stations.

Number and horsepower of stationary motors.—In Table 64 is shown the relative development of the power business of central electric stations in different sections of the United States, together with the rate of increase in the different sections. Owing to the fact, however, that several large commercial plants reported the total horsepower of their motors without giving the number of the same for 1917, it is rather difficult to make satisfactory comparisons with earlier years. As indicated in Table 65, 41 plants, reporting a total motor horsepower of 3,418,090, failed

to return the number of their motors. The importance of the major part of these plants is indicated by the fact that the average horsepower of their stationary motors is 83,368, whereas the average for the plants in the United States is only 1,409. It was, of course, possible to make some adjustments for these discrepancies by deducting this horsepower in the various divisions from the total horsepower reported, so that the number of motors appearing in the table would correspond accurately to the horsepower listed. The changes which would result from these deductions have been indicated in parentheses in Table 64, but in studying the revised figures two considerations must be borne in mind. First, while most stations reported the number of their motors served in 1912 and 1907, no doubt in many cases, particularly at the former date, these numbers, so far as the larger commercial plants are concerned, were merely estimates, and consequently little credence can be put in attempted numerical comparisons for this group of plants. In the second place, it is well to remember that many of those larger plants which failed to report the number of motors beyond a doubt served larger motors than did the average station. Hence it is probable that the revised "average capacity" for motors for 1917 is, in many cases, much lower than the actual average. With the information secured, however, no more accurate data are available.

Table 64

CENTRAL ELECTRIC STATIONS—NUMBER AND HORSEPOWER CAPACITY OF STATIONARY MOTORS: 1917, 1912, AND 1907.

DIVISION. ¹	1917		1912		1907		Average capacity.			Per cent of increase in horsepower.			Per cent of total horsepower.		
	Number.	Horsepower. ²	Number.	Horsepower.	Number.	Horsepower.	1917 ²	1912	1907	1907-1917	1912-1917	1907-1912	1917	1912	1907
United States.....	555,924	9,216,230 (5,798,240)	435,473	4,130,619	167,184	1,649,026	16.58 (10.42)	9.49	9.86	458.9	123.1	150.5	100.0	100.0	100.0
New England.....	101,513	876,600 (819,721)	55,042	391,308	23,841	154,720	8.64 (8.07)	7.11	6.49	466.6	124.0	152.9	9.5	9.5	9.4
Middle Atlantic.....	157,087	2,596,057 (1,888,939)	124,416	1,213,681	34,108	544,020	16.53 (12.02)	9.76	15.95	377.2	113.9	123.1	28.2	29.4	33.0
East North Central.....	119,060	1,920,649 (1,061,181)	114,404	799,421	49,345	307,558	16.13 (8.91)	6.99	6.23	524.5	140.2	159.9	20.8	19.4	18.6
West North Central.....	65,188	757,051 (681,616)	47,540	316,113	19,027	138,027	11.61 (10.45)	6.65	7.25	448.5	139.5	129.0	8.2	7.7	8.4
South Atlantic.....	19,589	515,293 (318,928)	26,163	361,011	8,948	95,373	26.30 (16.28)	13.80	10.66	440.3	42.7	278.5	5.6	8.7	5.8
East South Central.....	15,383	138,127 (134,143)	7,592	62,081	3,039	21,656	8.98 (8.72)	8.18	7.13	537.8	122.5	186.7	1.5	1.5	1.3
West South Central.....	25,634	273,467 (253,793)	15,337	103,765	7,220	42,507	10.65 (9.88)	6.77	5.89	543.3	163.5	144.1	3.0	2.5	2.6
Mountain.....	21,978	632,439 (278,931)	12,114	235,506	6,091	94,960	28.78 (12.69)	19.44	15.59	566.0	168.5	148.0	6.9	5.7	5.8
Pacific.....	30,442	1,506,647 (360,988)	32,865	647,733	15,565	250,205	49.49 (11.86)	19.71	16.07	502.2	132.6	158.9	16.3	15.7	15.2

¹ See p. 18 for states composing the several geographic divisions.

² Some of the larger stations failed to report the number of stationary motors. Figures in parentheses indicate horsepower represented by the number of motors shown.

It is interesting to note that during the last decade the rate of increase in horsepower of motors for the various divisions has been relatively uniform, though less rapid for the period from 1912 to 1917, 123.1 per cent, as contrasted with 150.5 per cent in the preceding period. Further, those divisions which led the increase between 1907 and 1912—the South Atlantic (278.5 per cent), East South Central (186.7 per cent), and East North Central (159.9 per cent)—were, in the main, superseded by other divisions in the later period.

For these years the leaders were the Mountain division (168.5 per cent), the West South Central (163.5 per cent), the East North Central (140.2 per cent), the West North Central (139.5 per cent), and the Pacific (132.6 per cent). Finally, in 1917, as in 1912 and 1907, the Middle Atlantic, East North Central, and Pacific divisions show the largest proportion of the total horsepower, 28.2, 20.8, and 16.3 per cent, respectively, and there has been in the last 10 years comparatively little change in these relative percentages.

Table 65

DIVISION AND STATE.	CENTRAL ELECTRIC STATIONS FAILING TO REPORT NUMBER OF MOTORS BUT REPORTING THE TOTAL HORSE-POWER: 1917.	
	Number of stations reporting no motors.	Horse-power.
United States.....	41	3,418,000
New England.....	4	56,879
Vermont.....	3	3,865
Connecticut.....	1	53,014
Middle Atlantic.....	6	707,118
New York.....	3	524,006
Pennsylvania.....	3	183,112
East North Central.....	4	859,468
Illinois.....	3	858,031
Wisconsin.....	1	1,437
West North Central.....	4	75,435
Iowa.....	1	15,127
Missouri.....	1	38,413
Kansas.....	2	21,895
South Atlantic.....	9	196,365
Maryland.....	1	149,507
District of Columbia.....	1	29,150
Virginia.....	1	200
North Carolina.....	2	14,693
South Carolina.....	4	2,815
East South Central.....	1	3,984
Tennessee.....	1	3,984
West South Central.....	3	19,674
Arkansas.....	1	1,091
Louisiana.....	1	3,851
Texas.....	1	14,732
Mountain.....	3	353,508
Montana.....	2	234,640
Utah.....	1	118,868
Pacific.....	7	1,145,659
California.....	7	1,145,659

Averages per station, etc.—Table 66 had been prepared in order to show the comparative averages in line equipment for commercial and municipal stations in the three census periods 1917, 1912, and 1907. From this table, also, can be readily deduced the rate of growth per station in the various significant items. It will be noted that the per cent of decrease in the average number of arc lamps per station since 1912 has been about 32 per cent for commercial plants and 60 per cent for municipal plants. It is further surprising to find that in 1912 the average number of street incandescent lamps per station was greater for municipal (133) than for commercial plants (130). This, of course, confirms the previous suggestion that, relative to the amount of population served, municipal plants are much more generous with their street lighting, though, of course, it should be remembered that the wattage of the municipal street lamps may sometimes be lower than that of the commercial lamps. On this point, however, it was scarcely feasible to secure statistics, nor was the estimated amount of current used for street lighting called for separately in the schedule. By 1917 the average had increased for the commercial plants by 75.4 per cent to 228 per station, while for municipal plants the increase had been only 36.1 per cent to 181 per station.

Table 66

ITEM.	Census year.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—LINE EQUIPMENT, AVERAGE PER STATION.		
		Total.	Commercial.	Municipal.
Street lamps:				
Average number of arcs per station.....	1917	39	49	22
	1912	67	72	54
	1907	(¹)	(¹)	(¹)
Average number of incandescent lamps per station.....	1917	211	228	181
	1912	131	130	133
	1907	(¹)	(¹)	(¹)
Meters on consumption circuits:				
Average number per station.....	1917	1,066	1,461	401
	1912	693	880	301
	1907	357	424	172
Ratio of meters to customers (per cent).....	1917	98.9	99.5	95.3
	1912	94.3	95.0	89.4
	1907	86.5	88.3	75.9
Stationary motors:				
Average number per station.....	1917	85	120	22
	1912	83	113	14
	1907	35	47	4
Average horsepower per station.....	1917	1,409	2,081	184
	1912	791	1,084	105
	1907	350	467	25
Average horsepower per motor.....	1917	17	17	8
	1912	*(12)	*(11)	8
	1907	10	10	7
Ratio of customers to population of districts served (per cent).....	1917	* 11.4	11.0	7.1

¹ Figures not available.

* Adjusted to cover only those plants which made complete returns.

* Duplicated population eliminated.

The number of meters on consumption circuits has during both five-year periods increased with far greater rapidity for commercial stations, more than doubling between 1907 and 1912, and increasing about 70 per cent in the last five-year period. For municipal plants, on the other hand, the growth during the earlier period was only 75 per cent, and between 1912 and 1917 only 33.2 per cent. During the latest five-year period the growth in number of meters has been practically coextensive with the growth in the number of customers. In 1917 the average number of customers per commercial station was 1,461 and for municipal stations 401. It is further interesting to note in this connection that, even at the present time, the commercial plants have a considerable advantage over municipal plants in the matter of metered current, the ratio of meters to customers being 99.5 per cent for the former and only 95.3 per cent for the latter. The disparity, however, was much greater in 1907, when for the commercial plants the ratio was 88.3, while for municipal plants it was only 75.9. In other words, at this date probably not more than three-fourths of the customers of municipal plants were supplied with meters.

In the matter of stationary motors some rather surprising facts are shown in this table. The average number per commercial station in 1917 was 120, an increase of only 6.2 per cent since 1912. The growth for municipal plants since 1912 has been much more rapid (57.1 per cent), but the absolute number of motors per station is, for commercial plants, five and one-half times as great as for municipal plants (22).

More significant is the condition indicated relative to the average horsepower of motors per station. It is found from the figures that not only has the growth in average horsepower since 1912 been more rapid for commercial plants (92 per cent) than for municipal plants (75.2 per cent), but the average horsepower for the former (2,081) is over eleven times as great as the average (184) for municipal plants. Finally, the average horsepower per motor for commercial stations making full reports has increased from 10 in 1912 to 11 in 1917, while for municipal plants it has remained the same, 8 in both years.

The ratio of customers to the population of districts served is, as might be expected, much greater for commercial stations (11 per cent) than for municipal plants (7.1 per cent), the larger proportion of which are located in the smaller population groups. Not only do commercial plants have as customers a proportion of the inhabitants of their territory which is more than 50 per cent greater than the proportion reported by municipal plants, but on the average they also supply these customers with a far higher amount of current. Earlier figures given indicate that the amount of current actually supplied for lighting by commercial plants averages 717 kilowatt hours per customer reported, while the average for municipal plants is 683 kilowatt hours. These figures, of course, do not actually represent the number of kilowatt hours consumed for light per individual customer, since a large proportion of lighting service is covered by street lighting, public-building lighting, and similar service other than domestic. The relative conditions in this regard, however, are presumably about the same in the two groups of plants. In the matter of power service, per customer a very wide difference is found between commercial and municipal plants. The former supply an average of 2,069 kilowatt hours for power per customer reported, while the latter supply only 350 kilowatt hours, or about one-sixth as much. Again, these figures must be taken with caution, in view of the fact that probably a relatively small proportion of all customers reported by either group are supplied with power. The data, however, are of considerable interest.

Subsidiary equipment.—The data contained in Table 67 are of no great public interest. The great excess of subsidiary equipment reported by commercial plants over the amount of such equipment reported by municipal stations is to be expected, in view of the far greater size of the former, as well as in view of the fact that the latter have practically no substations. It is, however, interesting to find that electric railways return more than half the rotary converters and motor generator sets, both in number and kilowatt capacity, while the proportion of transformers in stations and substations for the street railways is also extraordinarily large as compared

with that of the central stations. The average capacity per transformer, however, is higher for the central electric stations, 431 kilowatts, than for the electric railways, 340 kilowatts. For the commercial stations, also, the average capacity of 454 kilowatts per transformer is 148 per cent greater than the average capacity per transformer for the municipal stations (183 kilowatts). This, however, is natural on account of the relatively smaller generating units of the latter.

Table 67

	Census year.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—SUBSIDIARY EQUIPMENT.					
		Rotary converters and motor generator sets. ¹		Boosters.		Transformers.	
		Number.	Kilowatt capacity.	Number.	Kilowatt capacity.	Number.	Kilowatt capacity.
Total.....	1917	6,048	4,237,935	512	76,725	31,273	12,635,943
	1912	4,667	2,646,396	511	47,028	22,304	8,461,336
	1907	2,532	1,305,651	261	21,866	11,062	2,826,983
Central stations.....	1917	2,659	1,898,602	374	50,208	22,046	9,469,006
	1912	1,827	1,009,136	328	22,821	13,868	4,103,939
	1907	670	363,419	127	4,810	5,788	1,983,532
Commercial.....	1917	2,585	1,884,501	353	49,464	20,174	9,155,796
	1912	1,781	996,531	295	20,151	12,972	4,039,236
	1907	665	362,706	106	4,474	5,479	1,677,682
Municipal.....	1917	74	14,101	21	744	1,872	343,208
	1912	46	12,605	33	2,670	896	64,703
	1907	5	713	21	336	309	15,850
Electric railways.....	1917	3,389	2,339,333	138	26,517	9,227	3,126,937
	1912	2,840	1,637,260	183	24,807	8,436	2,357,397
	1907	1,862	942,232	134	17,046	5,274	1,133,161

¹ In 1907 motor generator sets were not included.

Finally, it may be worth while to mention that the total number of auxiliary generators reported for the two groups of plants, 338, with a total capacity of 34,623 kilowatts, is too small to be of any significance, nor is it altogether certain just what kind of units were reported under this head.

In the matter of storage batteries, also, the total number of cells reported was 113,452, with a total capacity in ampere hours of 1,271,243. Of this amount practically the entire capacity, or 1,252,440 ampere hours, was reported by commercial plants, which returned a total of 106,484 cells. This left the municipal plants with only 6,968 cells and the insignificant capacity of 18,803 ampere hours. While it is true that some small stations, both municipal and commercial, particularly in the West North Central states, reported a considerable number of storage batteries of an inexpensive type, which were used to carry the "light load" in the daytime when the dynamos were not operated, yet by far the greater amount, both in number and capacity, were reported by the very large commercial stations, which frequently store a considerable amount of current to be used in cases of emergency resulting from the possible breakdown of a portion of their generating system. On account of the very high cost of large storage batteries, only the more important plants can afford to install them.

CHAPTER VIII.—FINANCIAL STATISTICS.

CAPITAL.

The balance sheet.—Owing to the lack of uniformity in accounting systems as well as to the differences which exist in the matter of public regulation of central electric stations in the different states, it is difficult to secure satisfactory balance sheets from all plants. Some have their own accounting systems developed with a view to meeting their particular needs, and they find it difficult to readjust the various items in conformity to the census requirements. Others, particularly the smaller stations, do not keep their books in sufficient detail to enable them to return satisfactory replies to all inquiries. In the case of composite plants, also, it is sometimes an extremely difficult matter to make a satisfactory segregation of any of the items on the balance sheet, though in practically all cases reasonable estimates have been secured when absolute figures were not available.

So far as the commercial stations are concerned, the balance sheets of the numerous large plants are so important as to reduce to a negligible quantity any inconsistencies which may have appeared in the accounts of the smaller plants. Great difficulty, however, was experienced at this census, as well as at the earlier periods, in securing from the majority of municipal plants data which would conform to the census requirements. As a large number of states do not attempt any kind of commission regulation of publicly owned stations, and since, even when commission regulation does exist, the requirements are frequently not so specific for municipal stations as for the companies, it frequently happens that the accounts of these plants are almost hopelessly involved and combined with the general accounts of the municipality which owns them. Hence, in spite of all efforts which have been made to obtain correct figures, it is probable that the data covering municipal plants are not so trustworthy as those secured from the commercial stations.

For 1917, in addition to the items on the 1912 schedule, a call was made for the value of "other physical property," which supposedly includes discarded portions of plant and equipment, and in some cases office supplies and fixtures, etc., none of which are a part of the active *electric* plant, but which were no doubt included in the value of plant and equipment in 1912. "Cash and notes and accounts receivable" have also been separated from "materials and supplies," while an entry was also made for "interest, dividends, and rents receivable." Under "Liabilities" a similar new item appears in "premium on capital stock and funded debt."

Table 68

ITEM.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE BALANCE SHEETS: 1917.			
	Commercial.		Municipal.	
	Amount.	Per cent of total.	Amount.	Per cent of total.
Total assets or liabilities.....	\$3,631,973,213	100.0	\$148,345,165	100.0
ASSETS.				
Value of plant and equipment.....	2,933,016,941	80.8	127,375,200	85.9
Other physical property.....	31,216,857	0.9	2,626,531	1.8
Stocks and bonds of other electric companies.....	129,525,114	3.6		
Stocks and bonds of companies other than electric companies.....	60,407,516	1.7	60,869	(¹)
Treasury securities.....	66,665,218	1.8	206,254	0.1
Other permanent investments.....	25,725,283	0.7	1,379,472	0.9
Cash and notes and accounts receivable.....	174,565,669	4.8	8,737,386	5.9
Materials and supplies.....	58,406,556	1.6	3,281,215	2.2
Stock and bond discount.....	61,528,787	1.7	25,786	(¹)
Sinking and other special funds.....	23,256,366	0.6	2,784,285	1.9
Interest, dividends, and rents receivable.....	4,340,555	0.1	14,427	(¹)
Sundries.....	53,030,040	1.5	1,297,945	0.9
Profit and loss deficit for stations showing a deficit.....	10,198,211	0.3	653,795	0.4
LIABILITIES.				
Capital stock.....	1,580,251,265	43.0		
Funded debt.....	1,297,319,859	35.7	54,973,742	37.1
Cash investment.....	16,057,957	0.4	51,791,104	34.9
Real estate mortgages.....	15,236,581	0.4	174,309	0.1
Floating debt.....	203,030,128	5.6	3,490,038	2.4
Reserves.....	164,865,402	4.5	7,294,905	4.9
Bills and accounts payable.....	101,709,863	2.8	2,297,286	1.5
Interest, rents, and taxes due and accrued.....	38,633,405	1.1	1,886,405	1.3
Dividends due and payable, but unpaid.....	5,265,314	0.1		
Premium on capital stock and funded debt.....	25,914,106	0.7	86,528	0.1
Sundries.....	27,722,329	0.8	626,099	0.4
Profit and loss surplus for stations showing a surplus.....	175,967,002	4.8	25,724,749	17.3
Net surplus.....	165,768,791		25,070,954	

¹ Less than one-tenth of 1 per cent.

In Table 68 are shown the comparative relations which existed between the balance sheets of commercial and municipal central electric stations in 1917. Naturally a number of items which apply to commercial stations can not be returned by municipal plants which do not do a general financing business, and which secure their funds from the issue of bonds or from the tax levy instead of by means of stock issues. Probably no particular comment needs to be made on the figures here presented, as several of the important items will be discussed in detail in the following pages. Mention should, however, be made of the fact that municipal stations reported 1.9 per cent of their assets in sinking and other special funds, which, relative to the investment in plant and equipment, is much greater than the amount reported by commercial stations. This is due to the common practice on the part of municipalities of establishing sinking funds, sometimes created out of earnings and sometimes resulting from appropriations from the tax levy, for

the purpose of paying off their bonds at maturity. Companies, on the other hand, usually refund their indebtedness. It further appears that a certain number of commercial stations, 691, or 16.4 per cent of the total number, reported a profit and loss deficit of \$10,198,211. There were also 274 municipal plants, 11.8 per cent of the total number, which showed a deficit of \$653,795.

Among the liabilities it is found that the commercial plants have a relatively greater amount of floating debt and real estate mortgages outstanding than have the other group. The cash investment in municipal stations, however, equal to 34.9 per cent of the total liabilities, is extremely important, and represents roughly the amount which has been put into the property out of earnings or from the tax levy. For commercial stations this small item, four-tenths of 1 per cent of all liabilities, represents in general the investment in stations which are operating under the individual or partnership form of management.

Attention should finally be called to the fact that while commercial stations reported a profit and loss surplus of \$175,967,002, or 4.8 per cent of their total liabilities, municipal stations claim a surplus of \$25,724,749, or 17.3 per cent of all liabilities. In the former the net surplus amounts to 5.7 per cent of the value of plant and equipment and in the latter to 19.7 per cent. There is only one way of building up a surplus in the case of a commercial plant, namely, out of earnings from year to year. Municipal stations, however, frequently keep their books in such a way that appropriations made from the general tax levy, either for paying off bonds and notes at maturity or for original or new construction, are improperly recorded, so that when the debt liabilities are reduced there appears to be an increase in the profit and loss surplus instead of in the cash investment, as would be proper under the circumstances. It is therefore scarcely probable that after all the ordinary expenses of operation have been met so large a surplus has actually been built up out of annual earnings.

Capitalization.—The total capitalization of the commercial stations may be regarded as the sum of all the stock and interest-bearing obligations outstanding, together with the premium on capital stock and on bonds, as well as the cash investment in unincorporated plants. It is also possible to arrive at the apparent capitalization of municipal plants by the same process, though on account of the methods of accounting previously referred to the resultant figures are by no means a true index of the capital investment. Accordingly, it has been thought more satisfactory to use the reported investment in plant and equipment in the case of municipal stations.

As shown in Table 69, the gross capitalization of the electric light and power industry in the United States is \$3,245,185,098, of which amount \$127,375,200, or 3.9 per cent, represents the investment in municipal

stations. The principal items entering into this total for commercial stations are capital stock, amounting to exactly 50 per cent of their capitalization; bonds, to the extent of 41.7 per cent; and floating debt, amounting to 6.5 per cent. Cash investments, real estate mortgages, and premium on securities issued amount together to only 1.8 per cent. However, the total capitalization of \$3,117,809,898, indicated for commercial stations, is subject to some reduction. In order to arrive at the net capitalization for the electric light and power business alone it is necessary to deduct not only the amount of stock and bonds of other electric companies which are held, but also the securities of companies other than electric, as well as treasury securities, and other permanent investments outside the electric light and power industry. This makes necessary a total deduction of \$313,539,988, leaving a net capitalization of \$2,804,269,910, which is equivalent to 95.6 per cent of the reported investment in plant and equipment.

Table 69	CENTRAL ELECTRIC STATIONS—CAPITALIZATION.			
	Amount.		Per cent of total—Commercial stations.	
	1917	1912	1917	1912
Total.....	\$3,245,185,098	\$2,289,622,199	.....	.....
Commercial stations:				
Capital stock.....	1,560,251,265	1,154,587,016	50.0	52.2
Common.....	1,278,887,492	977,639,067	.....	.....
Preferred.....	271,651,913	176,947,959	.....	.....
Debt.....	10,311,860	(1)	.....	.....
Funded debt.....	1,297,319,859	897,907,681	41.7	40.6
Floating debt.....	203,030,128	137,726,385	6.5	6.2
Cash investments.....	16,057,957	12,165,075	0.5	0.5
Real estate mortgages.....	15,236,581	10,170,898	0.5	0.5
Premium on capital stock and funded debt.....	25,914,108	(1)	0.8	.....
Total.....	3,117,809,898	2,212,557,055	100.0	100.0
Deduct intercompany holdings and treasury securities.....	196,190,332	126,305,618	.....	.....
Net capital.....	2,921,619,566	2,086,251,437	.....	.....
Deduct investments outside of electric light and power industry.....	117,349,656	76,721,716	.....	.....
Net capital based on electric light and power industry.....	2,804,269,910	2,009,529,721	.....	.....
Municipal stations: Value of plant and equipment.....	127,375,200	77,065,144	.....	.....

¹ Not reported.

While the indicated capitalization of municipal plants has not been used in Table 69, it may be of some interest to present the figures for 1917 and 1912, and this is done in Table 70.

Table 70	CAPITALIZATION OF MUNICIPAL CENTRAL ELECTRIC STATIONS: 1917 AND 1912.			
			Per cent of total.	
	1917	1912	1917	1912
Total.....	\$110,515,721	\$63,558,310	100.0	100.0
Funded debt.....	54,973,742	31,189,357	49.7	49.1
Premium on funded debt.....	86,528	.....	0.1	.....
Floating debt.....	3,490,038	4,959,332	3.2	7.8
Real estate mortgages.....	174,309	244,608	0.2	0.5
Cash investment.....	51,791,104	27,064,963	46.9	42.6

The total for funded debt, including premiums on the same, floating debt, real estate mortgages, and cash investments, in 1917 was \$110,515,721, or 86.8 per cent of the total value of plant and equipment reported. In 1912 the corresponding figures were \$63,558,310, or 82.5 per cent of the value of plant and equipment. There has been a marked decrease since 1912 in the relative importance of floating debt, from 7.8 per cent to only 3.2 per cent. There has, however, been an almost correlative increase in the proportion of capitalization which is represented by cash invest-

ment, from 42.6 per cent in 1912 to 46.9 per cent in 1917. Almost half of the capitalization, however, was at the two dates represented by bonds.

Capital stock and funded debt of incorporated commercial stations.—A brief reference should be made to the increase in capital stock and bonds shown by commercial companies since 1907. These are the more stable items in the balance sheet, as they are rarely if ever subject to decrease. Cash investments, real estate mortgages, floating debt, etc., are, on the other hand, constantly fluctuating.

Table 71

	COMMERCIAL COMPANIES—CAPITAL STOCK, FUNDED DEBT, AND DIVIDENDS: 1917, 1912, AND 1907.					
	1917	1912	1907	Per cent of increase.		
				1907-1917	1912-1917	1907-1912
Number of commercial companies having outstanding capitalization.....	12,785	12,663	12,516	10.7	4.6	5.8
Total capitalization outstanding.....	\$2,857,571,124	\$2,052,494,697	\$1,341,965,182	112.9	39.2	52.9
Capital stock.....	1,580,251,265	1,154,587,016	741,317,497	110.5	35.1	55.7
Common.....	1,278,887,492	977,639,057	666,008,772	92.0	30.8	46.8
Preferred.....	271,051,913	176,947,959	75,313,725	259.9	53.2	134.9
Debenture.....	10,311,860	(4)	(4)			
Funded debt.....	1,297,319,859	897,907,681	600,677,685	116.0	44.5	49.5
Dividends, amount.....	64,589,321	34,580,872	19,300,872	234.6	86.8	70.2
On common stock.....	52,326,438	28,602,399	16,883,812	209.9	82.9	69.4
On preferred stock.....	12,262,883	5,978,473	2,416,760	407.4	105.1	147.4

¹ Exclusive of the capitalization of 160 electric railways which operated electric light and power departments, and 133 central electric stations not reporting stock and bonds for sundry reasons, but including 52 stations whose capitalization was reported by other stations, and 32 stations reporting bonds only.

² Exclusive of the capitalization of 169 electric railways which operated electric light and power departments, and 116 central electric stations not reporting stock and bonds for sundry reasons, but including 18 stations whose capitalization was reported by other stations, and 23 stations reporting bonds only.

³ Exclusive of 37 companies (21 operating electric railways with capitalization included in report for street and electric railways; 9 corporations reporting capitalization in one state and owning establishments in another state, which are reported separately in certain of the tables; and 7 not reporting capitalization for sundry reasons), but including 2 companies reporting bonds only, their capital stock not being separable from that representing other interests.

⁴ Not reported.

From Table 71 it appears that there has been little change in the actual number of companies having outstanding capitalization, the increase being only 10.7 per cent during the decade and 4.6 per cent during the past five years. The total capitalization during the same periods has increased 112.9 per cent and 39.2 per cent, respectively. Upon examining the various items further we find that the funded debt has, during the past five years as well as during the decade, increased more rapidly than the stock issues, though between 1907 and 1912 the capital stock grew more rapidly than the bonds outstanding. Between 1912 and 1917 there was an increase of only 35.1 per cent in all capital stock and of 44.5 per cent in funded debt. During this period, also, the preferred stock issues showed an increase of 53.2 per cent as opposed to a gain of only 30.8 per cent for the common stock. These figures no doubt point to the fact that it has within the past few years been increasingly difficult to secure capital for investment in public-utility enterprises unless a very definite guaranty of a fair return is made. Hence the preference for bonds and preferred stock, which appeal to the cautious investor. It is, however, interesting to note that the total amount of dividends paid on outstanding stock has at all periods increased more rapidly than has the par value of the stock issued. This fact indicates an increasingly higher rate of dividend for those companies which actually paid dividends at the various dates. This

condition is clearly indicated in Table 72, which shows the rates of dividend paid on all stock as well as on the common and the preferred at the four census periods.

	RATE OF DIVIDENDS PAID ON CAPITAL STOCK OF COMMERCIAL COMPANIES.			
	1917	1912	1907	1902
All stock.....	4.1	3.0	2.6	1.7
Common.....	4.1	2.9	2.5	1.6
Preferred.....	4.5	3.4	3.2	2.6

¹ Includes interest on debenture stock.

From Table 72 it can be seen that the average rate was highest in 1917, 4.1 per cent on the common stock and 4.5 per cent on the preferred, and that the increase in rate has been most rapid since 1912. The rate of dividend on the reported value of plant and equipment was, however, equal to only 2.2 per cent in 1917 and 1.6 per cent in 1912. Also, it should be noted that by no means all of the common or even of the preferred stock paid dividends during 1917. In this year there were 1,976 companies which paid no dividends whatever. These, of course, were mostly small concerns, but they comprise 67.8 per cent of the total number of incorporated central electric stations and 71 per cent of all which have outstanding capitalization.

Value of plant and equipment.—It is a difficult matter indeed in a census of this kind to secure wholly accurate data as to the actual value of central-station property in the United States. Some plants carry on their books the entire cost of their property to the year covered by the present report. Others report the depreciated value, estimated according to local standards and conditions. Some stations, again, report the actual purchase cost of the property from former holders, while in many cases the value is utterly unknown and the figures are merely the crudest estimates.

In addition to these difficulties it should be noted that some companies include many intangible items in the valuation in addition to the actual physical property used. Good-will franchises of different sorts, prospective earnings, and other items frequently find their way into the book value of the plant. Further, regard must be had to local conditions and to the nature of business and the physical organization of each plant. One which always has purchased its current will normally have a relatively low investment in proportion to the amount of business done. On the other hand, a purchasing plant which formerly generated current may have a large investment in unused generating equipment of different kinds which will cause the value to appear unduly high. A plant doing an extensive lighting business will find it necessary to put a great deal of money into service lines, meters, transformers, etc., which would not be needed in the case of a larger plant engaged primarily in the business of supplying current for power. Again, the legitimate investment differs widely in accordance with the nature of primary power used. A water-power plant, which is ordinarily operated at a very low cost per kilowatt hour, usually requires a relatively high investment for developmental purposes. Expensive storage dams must frequently be constructed, water-power rights secured, and considerable portions of land bought, which, while not actually a part of the plant and equipment, are yet a perfectly justifiable investment, and without which it would be impossible to install and operate the plant. Finally, such stations frequently equip themselves with a view to future rather than merely present needs, and install more primary power equipment than is required to operate their dynamos. For all of these reasons a comparatively high investment can be looked for in this group of stations.

Finally, as previously mentioned, it must be borne in mind that probably in most cases no satisfactory general comparison can be made between the investment in municipal plants and the investment in commercial plants. The former, almost without exception, confine their services to a restricted area, furnishing current only to the municipality in which they are located. The latter serve many different

municipalities, varying from the average of almost 3 per station to as high as 150 or 200 in some cases. This means that they have a heavy investment in distribution lines, frequently far in excess of the investment in their central generating stations. Many municipal plants confine their activities pretty largely to the supply of current for street lighting and for municipal power, and consequently do not incur the numerous investments which must be made in order to serve a wide variety of customers acceptably. Not only does it frequently happen that no separate record of the value of municipal plants is kept, but also there appears to be a disposition on the part of many municipal officials in their accounting to lose sight of the investments which have been made in their plants by means of appropriations from the tax levy or through reinvested earnings. Finally, it should be recalled that, as pointed out in a preceding chapter, the municipal plants report a relatively high proportion of antiquated equipment as compared with commercial stations—a fact which probably indicates that they have made an attempt to economize on their capital outlays. Whether similar economies have been attempted in the matter of station construction, etc., it is impossible to state, though there is a strong probability that this is true. For these reasons it is to be expected that investment accounts of municipal plants, even granting that conditions of operation were similar, which is in general not the case, would be somewhat lower than for commercial stations.

Perhaps attention should further be called to the fact that, whereas at preceding censuses the *cost* of plant and equipment was called for, the schedules for 1917 ask for the *value* of plant and equipment. It may of course be possible in some cases that the book value for various reasons will be higher than the actual cost of the plant. It is generally true, however, that the value is somewhat lower than the cost. Hence it is to be expected that the 1917 figures may show a less marked growth than might have been looked for had the method of reporting been the same as that used at earlier dates. Most of the items included under "other physical property," also, were no doubt reported in 1912 and at earlier periods under "cost of plant and equipment."

In Table 73 is presented a comparative summary, by geographic divisions and states, of the investment accounts of commercial and municipal plants at the last three census periods, together with the per cent of increase, per cent of total, and per cent distribution. The greatest investment in commercial stations in 1917, as at the two preceding periods, is found in the Middle Atlantic, East North Central, and Pacific divisions. Municipal stations report the highest investment in the East North Central division (\$49,201,395), followed after a wide gap by the West

North Central, the Pacific, and the South Atlantic divisions. Among the different states New York leads, with an investment in commercial plants of \$415,608,131; California reports \$371,753,554, followed by Pennsylvania (\$254,873,397), Illinois (\$200,930,032), Massachusetts (\$124,798,808), and Michigan (\$122,703,011). No other states report as much as \$100,000,000. Those states ranking highest in municipal plant investment are Illinois (\$21,499,414),

California (\$9,816,091), Michigan (\$9,698,401), Ohio (\$9,172,571), Washington (\$7,854,363), Indiana (\$5,632,266), and Kansas (\$5,544,042). The remainder report less than \$5,000,000 investment, while the lowest amount is to be found in Nevada (\$25,431) and Rhode Island (\$30,000). The lowest investments in commercial plants are found in Mississippi (\$3,166,048), Wyoming (\$4,118,002), and New Mexico (\$4,120,622).

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—VALUE OF PLANT AND EQUIPMENT: 1917, 1912, AND 1907.

Table 73 DIVISION AND STATE.	TOTAL.			COMMERCIAL.			MUNICIPAL.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907
UNITED STATES.....	\$3,000,392,141	\$2,175,678,266	\$1,096,913,622	\$2,933,016,941	\$2,098,613,122	\$1,054,034,175	\$127,375,200	\$77,065,144	\$42,879,447
GEOGRAPHIC DIVISIONS:									
New England.....	244,925,811	153,468,258	92,582,350	237,951,257	147,947,181	88,230,999	6,974,554	5,521,077	4,351,351
Middle Atlantic.....	773,905,743	584,107,361	391,858,983	767,740,627	580,011,561	388,371,339	6,165,116	4,085,800	3,487,644
East North Central.....	577,427,839	388,575,873	203,859,358	528,226,444	357,102,214	186,793,279	49,201,395	31,473,659	17,066,079
West North Central.....	319,259,184	170,306,935	86,378,753	298,840,441	159,568,592	80,489,670	20,418,743	10,738,343	5,889,083
South Atlantic.....	184,366,719	134,310,186	58,513,594	172,639,749	127,176,089	54,437,552	11,726,970	7,134,097	4,076,042
East South Central.....	137,565,679	74,964,574	27,384,959	132,457,183	70,769,454	24,629,956	5,108,496	4,195,120	2,755,003
West South Central.....	111,225,153	76,052,774	31,981,172	104,424,832	71,991,145	30,477,054	6,800,321	4,061,629	1,504,118
Mountain.....	264,360,203	203,195,798	57,380,775	261,928,362	201,965,269	56,829,573	2,431,941	1,230,529	551,202
Pacific.....	447,355,710	390,696,507	146,973,678	428,808,046	382,081,617	143,774,753	18,547,664	8,614,890	3,198,925
NEW ENGLAND:									
Maine.....	28,274,341	19,926,292	12,629,101	27,872,766	19,687,956	12,443,798	401,575	238,336	185,303
New Hampshire.....	20,564,802	18,061,576	8,695,652	20,384,067	17,905,032	8,618,803	180,735	156,544	76,849
Vermont.....	15,722,879	10,027,600	7,234,498	14,628,325	9,277,420	6,652,907	1,094,554	750,180	581,591
Massachusetts.....	128,935,843	71,707,238	43,279,226	124,798,808	68,395,610	40,523,245	4,137,035	3,311,628	2,755,981
Rhode Island.....	17,703,309	11,339,294	7,327,862	17,673,309	11,330,919	7,295,943	30,000	8,375	31,919
Connecticut.....	33,724,637	22,406,258	13,416,011	32,593,982	21,350,244	12,696,303	1,130,655	1,056,014	719,708
MIDDLE ATLANTIC:									
New York.....	418,137,847	350,526,904	252,731,789	415,608,131	348,696,341	251,199,662	2,529,716	1,830,563	1,532,127
New Jersey.....	98,202,758	69,058,381	65,219,445	97,259,099	68,699,160	64,961,012	943,659	389,221	258,433
Pennsylvania.....	257,565,138	164,522,076	73,907,749	254,873,397	162,646,060	72,210,665	2,691,741	1,876,016	1,697,064
EAST NORTH CENTRAL:									
Ohio.....	97,827,744	69,243,894	42,557,000	88,655,173	64,625,010	39,132,506	9,172,571	4,618,884	3,424,494
Indiana.....	62,463,212	47,930,252	25,680,710	56,830,946	43,747,700	23,427,532	5,632,266	4,182,562	2,293,178
Illinois.....	222,429,446	162,104,226	88,142,233	200,930,032	147,782,620	82,196,708	21,499,414	14,321,406	5,946,525
Michigan.....	132,401,412	72,764,830	37,001,060	122,703,011	66,285,610	32,656,235	9,698,401	6,479,220	4,344,826
Wisconsin.....	62,306,025	36,532,671	10,478,355	59,107,282	34,661,074	9,381,298	3,198,743	1,871,597	1,097,067
WEST NORTH CENTRAL:									
Minnesota.....	78,143,330	44,360,910	24,138,081	73,631,897	41,767,683	22,192,783	4,511,433	2,593,227	1,945,328
Iowa.....	83,693,734	22,126,518	9,986,666	80,159,582	20,555,159	8,965,989	3,534,152	1,571,359	1,032,677
Missouri.....	68,271,685	48,624,710	33,865,760	65,645,584	46,350,586	32,554,571	2,626,101	2,274,124	1,311,189
North Dakota.....	8,006,632	4,891,632	1,619,997	7,562,839	4,598,964	1,474,985	443,793	262,668	145,012
South Dakota.....	14,923,220	11,318,041	2,806,363	14,111,604	10,985,158	2,607,668	811,616	332,883	196,695
Nebraska.....	30,022,944	12,971,316	7,372,081	27,075,338	11,565,718	6,863,096	2,947,606	1,405,598	508,985
Kansas.....	36,197,639	26,023,806	6,596,806	30,633,597	23,745,324	6,842,608	5,544,042	2,278,484	747,197
SOUTH ATLANTIC:									
Delaware, Maryland, and District of Columbia.....	44,015,770	39,970,422	34,010,868	43,315,047	39,527,113	33,662,977	700,723	443,309	347,891
Virginia.....	25,690,743	10,927,379	1,790,271	23,941,401	9,517,318	1,338,257	1,749,342	1,410,061	452,014
West Virginia.....	17,240,227	13,380,173	2,682,935	17,089,102	13,280,643	2,582,063	1,511,125	109,830	100,872
North Carolina.....	35,563,149	12,060,231	2,241,791	33,171,640	10,722,951	1,426,512	2,391,509	1,367,280	816,279
South Carolina.....	30,626,080	24,012,368	8,803,382	29,669,573	33,436,591	8,390,856	956,507	675,477	412,526
Georgia.....	22,709,945	19,890,925	7,354,296	20,107,602	18,344,251	6,226,692	2,602,343	1,546,674	1,127,594
Florida.....	8,520,806	4,026,688	1,690,061	5,345,384	2,346,922	811,195	3,176,421	1,681,766	818,866
EAST SOUTH CENTRAL:									
Kentucky.....	32,714,330	19,709,023	10,356,068	31,769,695	19,025,541	9,831,444	944,635	683,482	524,644
Tennessee.....	63,351,985	41,517,416	7,514,333	61,695,407	39,953,142	6,672,869	1,656,588	1,564,274	841,434
Alabama.....	36,797,899	8,726,776	7,263,876	35,826,033	7,975,241	6,804,059	971,866	751,535	489,817
Mississippi.....	4,701,455	5,011,359	2,220,662	3,166,048	3,815,530	1,321,554	1,535,407	1,195,829	899,106
WEST SOUTH CENTRAL:									
Arkansas.....	10,487,739	4,811,879	1,922,658	9,535,869	4,242,013	1,506,602	951,890	599,866	417,066
Louisiana.....	17,176,497	14,275,269	11,614,121	15,803,842	13,693,108	11,137,261	1,372,655	582,163	476,890
Oklahoma.....	23,528,513	13,552,640	7,130,864	20,806,650	11,697,728	6,928,514	2,721,863	1,654,914	202,350
Texas.....	60,032,414	43,612,986	11,313,529	58,278,471	42,358,300	10,906,677	1,763,943	1,264,686	407,852
MOUNTAIN:									
Montana.....	85,607,527	64,583,391	17,950,677	85,295,039	64,441,739	17,903,167	312,488	141,652	47,510
Idaho.....	28,376,832	32,482,566	3,251,480	27,875,340	32,345,940	3,203,567	501,492	236,626	47,893
Wyoming.....	4,224,780	2,200,032	942,326	4,118,002	2,167,082	942,326	106,778	33,000	.....
Colorado.....	55,042,937	66,989,142	23,126,179	54,613,808	66,709,390	23,006,536	429,129	279,752	120,643
New Mexico.....	4,292,243	3,133,780	989,317	4,120,622	3,070,644	989,317	171,621	63,116	.....
Arizona.....	11,960,884	9,258,049	1,672,589	11,853,487	9,258,049	1,672,589	107,397	.....	.....
Utah.....	58,353,630	11,555,496	5,148,596	57,576,025	11,095,475	4,813,440	777,605	480,021	335,156
Nevada.....	16,501,470	12,993,362	4,299,631	16,476,039	12,977,000	4,299,631	25,431	16,362	.....
PACIFIC:									
Washington.....	39,964,268	22,510,528	20,789,849	32,109,905	16,316,527	18,621,544	7,854,363	6,194,001	2,168,305
Oregon.....	25,821,797	23,796,747	14,403,278	24,944,587	23,230,309	14,281,632	877,210	566,438	121,646
California.....	381,569,645	344,389,232	111,780,551	371,753,554	342,534,781	110,871,577	9,816,091	1,854,451	908,974

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—VALUE OF PLANT AND EQUIPMENT: 1917, 1912, AND 1907—Continued.

Table 73—Continued.

DIVISION AND STATE.	ACTUAL INCREASE IN VALUE OF PLANT AND EQUIPMENT.								
	Total.			Commercial.			Municipal.		
	1907-1917	1912-1917	1907-1912	1907-1917	1912-1917	1907-1912	1907-1917	1912-1917	1907-1912
UNITED STATES.....	\$1,963,478,519	\$884,713,875	\$1,078,764,644	\$1,878,982,766	\$834,403,819	\$1,044,578,947	\$84,495,753	\$50,310,056	\$34,185,697
GEOGRAPHIC DIVISIONS:									
New England.....	152,843,461	91,457,553	60,885,908	149,720,258	90,004,076	59,716,182	2,623,203	1,453,477	1,169,726
Middle Atlantic.....	382,046,760	189,798,332	192,248,378	379,969,288	187,729,066	191,940,222	2,677,472	2,069,316	608,156
East North Central.....	373,568,481	188,851,966	184,716,515	341,438,185	171,124,280	170,308,905	32,135,816	17,737,788	14,407,680
West North Central.....	232,880,431	148,952,249	83,928,182	218,350,771	139,271,849	79,078,922	14,529,660	9,680,400	4,849,260
South Atlantic.....	126,853,125	50,056,533	75,796,592	118,202,197	45,463,640	72,738,557	7,650,928	4,592,873	3,058,055
East South Central.....	110,189,720	62,601,105	47,579,615	107,827,227	61,687,720	46,139,498	2,353,498	913,376	1,440,117
West South Central.....	79,243,981	35,172,879	44,071,602	73,947,778	32,433,687	41,514,091	5,296,203	2,738,692	2,557,511
Mountain.....	206,979,528	61,164,505	145,815,023	205,086,789	59,983,093	145,103,696	1,580,739	1,201,412	679,327
Pacific.....	300,882,082	56,659,203	243,722,829	285,033,293	46,726,429	238,306,864	16,348,739	9,932,774	5,415,965
NEW ENGLAND:									
Maine.....	15,645,240	8,348,049	7,297,191	15,428,968	8,184,810	7,244,158	216,272	163,239	53,033
New Hampshire.....	11,889,150	2,503,226	9,385,924	11,765,264	2,479,035	9,286,229	103,886	24,191	79,695
Vermont.....	8,488,881	5,695,279	2,793,102	7,975,418	5,850,905	2,624,513	512,963	344,374	168,589
Massachusetts.....	85,656,617	57,228,605	28,428,012	84,275,563	56,403,198	27,872,365	1,381,054	825,407	555,647
Rhode Island.....	10,875,447	6,364,015	4,011,432	10,377,366	6,342,390	4,034,976	—1,919	21,625	—22,544
Connecticut.....	20,308,626	11,318,379	8,990,247	19,897,679	11,243,738	8,653,941	410,947	74,641	336,306
MIDDLE ATLANTIC:									
New York.....	165,406,068	67,610,943	97,795,115	164,408,469	66,911,790	97,496,679	997,589	699,153	298,436
New Jersey.....	32,983,313	29,144,377	3,838,936	32,298,087	28,589,939	3,708,148	685,226	554,438	130,788
Pennsylvania.....	183,657,889	98,043,062	90,614,327	182,662,732	92,227,337	90,435,395	994,657	815,725	178,932
EAST NORTH CENTRAL:									
Ohio.....	55,370,744	28,583,850	26,686,894	49,522,667	24,080,163	25,492,504	5,748,077	4,553,687	1,194,390
Indiana.....	38,782,502	14,532,960	22,249,542	33,403,414	13,083,246	20,320,168	3,379,088	1,449,714	1,929,374
Illinois.....	134,287,213	60,325,220	73,961,993	118,734,324	53,147,212	65,587,112	15,552,889	7,178,008	8,374,881
Michigan.....	96,400,352	59,636,582	35,763,770	90,046,776	56,417,401	33,629,375	5,363,576	3,219,181	2,124,395
Wisconsin.....	51,827,670	25,773,354	26,054,316	49,726,984	24,446,208	25,279,776	2,101,686	1,327,146	774,540
WEST NORTH CENTRAL:									
Minnesota.....	54,005,249	33,782,420	20,222,829	51,439,144	31,864,214	19,574,930	2,566,105	1,918,206	647,899
Iowa.....	79,707,088	61,567,216	12,139,852	71,205,698	59,604,423	11,601,170	2,501,475	1,962,798	538,682
Missouri.....	34,406,925	19,646,975	14,759,860	33,091,013	19,294,998	13,796,015	1,814,912	961,977	963,935
North Dakota.....	6,886,635	3,125,000	3,261,635	6,087,854	2,963,875	3,123,979	298,781	161,125	137,656
South Dakota.....	12,116,857	3,605,179	8,511,678	11,503,936	3,126,448	8,377,490	612,921	478,733	134,188
Nebraska.....	22,650,863	17,051,628	5,599,235	20,212,242	15,509,620	4,702,622	2,438,621	1,542,008	896,613
Kansas.....	29,607,834	10,173,831	19,434,003	24,810,989	6,908,273	17,902,716	4,796,845	3,265,558	1,531,287
SOUTH ATLANTIC:									
Delaware, Maryland, and District of Columbia.....	10,004,902	4,045,348	5,959,554	9,652,070	3,787,934	5,864,136	352,832	257,414	95,418
Virginia.....	23,900,472	14,763,364	9,137,108	22,603,144	14,424,083	8,179,061	1,297,328	339,281	958,047
West Virginia.....	14,557,292	3,850,064	10,707,238	14,507,039	3,808,459	10,698,580	50,253	41,596	8,658
North Carolina.....	33,321,358	23,472,918	9,848,440	31,746,128	22,448,689	9,297,439	1,575,230	1,024,229	551,001
South Carolina.....	21,822,698	—3,386,288	25,208,986	21,278,717	—3,767,318	25,046,035	543,981	381,030	162,961
Georgia.....	15,355,659	2,819,020	12,536,639	13,880,910	1,763,351	12,117,559	1,474,749	1,055,669	419,080
Florida.....	6,890,744	4,492,117	2,398,627	4,534,189	2,968,462	1,565,727	2,356,555	1,493,655	862,900
EAST SOUTH CENTRAL:									
Kentucky.....	22,358,242	13,005,307	9,352,935	21,938,251	12,744,154	9,194,097	419,991	261,153	158,838
Tennessee.....	55,837,662	21,834,579	34,003,083	55,022,508	21,742,265	33,280,243	815,154	92,314	722,840
Alabama.....	29,504,023	28,071,123	1,432,900	29,021,974	27,850,792	1,171,182	482,049	220,331	261,718
Mississippi.....	2,480,793	—309,904	2,790,697	1,844,494	—649,482	2,493,976	636,299	339,578	296,721
WEST SOUTH CENTRAL:									
Arkansas.....	8,565,071	5,675,850	2,889,221	8,030,267	5,293,856	2,736,411	534,804	381,994	152,810
Louisiana.....	5,562,376	2,901,228	2,661,148	4,666,581	2,110,736	2,555,845	895,795	790,492	105,303
Oklahoma.....	16,397,649	10,175,873	6,221,776	13,878,136	9,108,924	4,769,212	2,519,513	1,066,949	1,452,564
Texas.....	48,718,885	16,419,428	32,299,457	47,372,794	15,920,171	31,452,623	1,346,091	499,257	846,834
MOUNTAIN:									
Montana.....	67,656,850	21,024,136	46,632,714	67,391,872	20,853,300	46,538,572	264,978	170,836	94,142
Idaho.....	26,125,372	—4,105,734	29,231,106	24,671,773	—4,370,600	29,042,373	453,599	264,866	188,733
Wyoming.....	3,282,454	2,024,748	1,257,706	3,175,676	1,960,970	1,224,706	106,778	73,778	33,000
Colorado.....	31,916,758	—11,946,205	43,862,963	31,608,272	—12,065,582	43,673,854	308,486	149,377	159,109
New Mexico.....	3,302,928	1,158,483	2,144,443	3,131,306	1,049,978	2,081,327	171,621	108,505	63,116
Arizona.....	10,288,295	2,702,835	7,585,460	10,180,898	2,585,438	7,595,460	107,397	107,397	—
Utah.....	53,205,034	46,798,134	6,406,900	52,762,585	46,480,550	6,282,035	442,449	817,584	124,865
Nevada.....	12,201,839	3,506,108	8,695,731	12,176,408	3,499,089	8,677,319	25,431	9,069	16,362
PACIFIC:									
Washington.....	19,174,419	17,453,740	1,720,679	13,488,361	15,793,378	—2,305,017	5,686,058	1,660,362	4,026,696
Oregon.....	11,418,519	2,025,050	9,393,469	10,662,955	1,714,278	8,948,677	755,564	310,772	444,792
California.....	269,789,094	87,180,413	182,608,681	260,881,977	29,218,773	231,663,204	8,907,117	7,961,640	945,477

* A minus sign (—) denotes decrease.

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—VALUE OF PLANT AND EQUIPMENT: 1917, 1912, AND 1907—Continued.

Table 73—Continued.	PER CENT OF INCREASE. ¹									PER CENT OF TOTAL.									PER CENT DISTRIBUTION.								
	Total.			Commercial.			Municipal.			Commercial.			Municipal.			Total.			Commercial.			Municipal.					
	1907-1917	1912-1917	1907-1912	1907-1917	1912-1917	1907-1912	1907-1917	1912-1917	1907-1912	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907			
	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907	1917	1912	1907			
UNITED STATES.....	179.0	40.7	98.3	178.3	39.8	99.1	197.1	65.3	79.7	95.8	96.5	96.1	4.2	3.5	3.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
Geographic Divisions:																											
New England.....	164.9	59.6	65.8	164.5	60.8	67.7	60.3	26.3	26.9	97.2	96.4	95.3	2.8	3.6	4.7	8.0	7.1	8.4	8.1	7.1	8.4	5.5	7.2	10.2			
Middle Atlantic.....	97.5	32.5	49.1	97.7	32.4	49.3	76.8	50.5	17.4	99.2	99.3	99.1	0.8	0.7	0.9	25.3	26.8	35.7	26.2	27.6	36.9	4.9	5.3	8.1			
East North Central.....	183.2	48.6	90.6	182.8	47.9	91.2	183.3	56.3	84.4	91.5	91.9	91.6	8.5	8.1	8.4	18.9	17.9	18.6	18.0	17.0	17.7	38.6	40.8	39.8			
West North Central.....	369.6	87.5	97.2	371.3	87.3	98.2	246.7	90.1	82.3	93.6	93.7	93.2	6.4	6.3	6.8	10.4	7.8	7.9	10.2	7.6	7.6	16.0	13.9	13.7			
South Atlantic.....	215.1	37.2	129.5	217.1	35.7	133.6	187.7	64.4	75.0	93.6	94.7	93.0	6.4	5.3	7.0	6.0	6.2	5.3	5.9	6.1	5.2	9.2	9.3	9.5			
East South Central.....	402.3	83.5	173.7	437.8	87.2	187.3	85.4	21.8	52.3	96.3	94.4	99.9	3.7	5.6	10.1	4.5	3.4	2.5	4.5	3.4	2.3	4.0	5.4	6.4			
West South Central.....	247.8	46.2	137.8	242.6	45.0	136.2	352.1	67.4	170.0	93.9	94.7	95.3	6.1	5.3	4.7	3.6	3.5	2.9	3.6	3.4	2.9	5.3	5.3	3.5			
Mountain.....	360.7	30.1	254.1	360.9	29.7	255.4	341.2	97.6	123.2	99.1	99.4	99.0	0.9	0.6	1.0	8.6	9.3	5.2	8.9	9.6	5.4	1.9	1.6	1.3			
Pacific.....	204.4	14.5	165.8	198.2	12.2	165.8	479.8	115.3	169.3	95.9	97.8	97.8	4.1	2.2	2.2	14.6	18.0	13.4	14.6	18.2	13.6	14.6	11.2	7.5			
New England:																											
Maine.....	123.9	41.9	57.8	124.0	41.6	58.2	116.7	68.5	28.6	98.6	98.8	98.5	1.4	1.2	1.5	0.9	0.9	1.2	0.9	0.9	1.2	0.3	0.3	0.4			
New Hampshire.....	136.5	13.8	107.7	136.5	13.8	107.7	135.2	15.4	103.7	99.1	99.1	99.1	0.9	0.9	0.9	0.7	0.8	0.8	0.7	0.9	0.8	0.1	0.2	0.2			
Vermont.....	117.3	66.8	38.6	119.9	57.7	39.4	88.2	45.9	29.0	93.0	92.5	92.0	7.0	7.5	8.0	0.5	0.5	0.6	0.5	0.5	0.6	0.9	1.0	1.4			
Massachusetts.....	197.9	79.8	65.7	208.0	82.5	68.8	50.1	24.9	20.2	96.8	95.4	93.6	3.2	4.6	6.4	4.2	3.3	3.9	4.2	3.3	3.9	3.3	3.4	6.4			
Rhode Island.....	141.6	56.1	54.7	142.2	56.0	55.3	-6.0	258.2	-73.8	99.8	99.9	99.6	0.2	0.1	0.4	0.6	0.5	0.7	0.6	0.5	0.7	(?)	(?)	0.1			
Connecticut.....	151.4	50.5	67.0	156.7	52.7	68.2	57.1	7.1	46.7	96.6	95.3	94.6	3.4	4.7	5.4	1.1	1.0	1.2	1.1	1.0	1.2	0.9	1.4	1.7			
Middle Atlantic:																											
New York.....	65.4	19.3	38.7	65.4	19.2	38.8	65.1	38.2	19.5	99.4	99.5	99.4	0.6	0.5	0.6	13.7	16.1	23.0	14.2	16.6	23.8	2.0	2.4	3.5			
New Jersey.....	50.6	42.2	5.6	49.7	41.6	5.7	265.1	142.4	50.6	99.0	99.4	99.6	1.0	0.6	0.4	3.2	3.2	5.9	3.3	3.3	6.2	0.8	0.5	0.6			
Pennsylvania.....	248.5	56.6	122.6	263.0	56.7	125.2	58.6	43.5	10.5	99.0	98.9	97.7	1.0	1.1	2.3	8.4	7.6	6.7	8.7	7.7	6.9	2.1	2.4	4.0			
East North Central:																											
Ohio.....	129.9	41.3	62.7	126.6	37.2	65.1	167.8	98.6	34.9	90.6	93.3	92.0	9.4	6.7	8.0	3.2	3.2	3.9	3.0	3.1	3.7	7.2	6.0	8.0			
Indiana.....	143.2	30.3	86.6	142.6	29.9	86.7	150.0	34.7	85.6	91.0	91.3	91.2	9.0	8.7	8.8	2.0	2.2	2.3	1.9	2.1	2.2	4.4	5.4	5.2			
Illinois.....	152.4	37.2	83.9	144.4	36.0	79.8	201.5	50.1	140.8	90.3	91.2	93.3	9.7	8.8	6.7	7.3	7.5	8.0	6.9	7.0	7.8	16.9	18.6	13.9			
Michigan.....	257.8	82.0	96.6	275.7	85.1	103.0	123.2	49.7	49.1	92.7	91.1	88.3	7.3	8.9	11.7	4.3	3.3	3.4	4.2	3.2	3.1	7.6	8.4	10.1			
Wisconsin.....	494.6	70.5	248.6	554.0	70.5	269.5	191.6	70.9	70.6	94.9	94.9	89.5	5.1	5.1	10.5	2.0	1.7	1.0	2.0	1.6	0.9	2.5	2.4	2.6			
West North Central:																											
Minnesota.....	223.7	76.2	83.8	231.8	76.3	88.2	131.9	74.0	33.3	94.2	94.2	91.9	5.8	5.8	8.1	2.5	2.0	2.2	2.5	2.0	2.1	3.5	3.4	4.5			
Iowa.....	738.0	278.2	121.6	795.2	290.0	129.6	242.2	124.9	52.2	95.8	92.9	89.7	4.2	7.1	10.3	2.7	1.0	0.9	2.8	1.0	0.8	2.8	2.0	2.4			
Missouri.....	101.6	40.4	43.6	102.6	41.6	42.4	100.3	15.5	73.4	96.2	95.3	96.1	3.8	4.7	3.9	2.2	2.2	3.1	2.2	2.2	3.1	2.1	2.9	3.0			
North Dakota.....	394.2	64.0	201.3	412.7	64.4	211.8	200.6	57.0	94.9	94.6	94.2	91.0	5.5	5.8	9.0	0.3	0.2	0.1	0.3	0.2	0.1	0.3	0.4	0.3			
South Dakota.....	431.8	31.8	303.3	441.2	28.5	321.3	308.5	243.8	67.5	94.6	94.7	92.9	5.4	2.9	7.1	0.5	0.5	0.3	0.5	0.5	0.2	0.6	0.4	0.5			
Nebraska.....	307.2	131.4	76.0	294.5	134.1	68.5	479.1	109.7	176.2	90.2	89.2	93.1	9.8	10.8	6.9	1.0	0.6	0.7	0.9	0.6	0.7	2.3	1.8	1.2			
Kansas.....	449.3	39.1	294.9	424.6	29.1	306.4	642.0	143.3	204.9	84.7	91.2	88.7	15.3	8.8	11.3	1.2	1.2	0.6	1.0	1.1	0.6	4.4	3.0	1.8			
South Atlantic:																											
Delaware, Maryland, and District of Columbia.....	29.4	10.1	17.5	28.7	9.6	17.4	201.4	58.1	27.4	98.4	98.9	99.0	1.6	1.1	1.0	1.4	1.8	3.1	1.5	1.9	3.2	0.5	0.6	0.8			
Virginia.....	1,335.0	135.1	510.4	1,689.0	151.6	611.2	287.0	24.1	212.0	93.2	87.1	74.8	6.8	12.9	25.2	0.8	0.5	0.2	0.8	0.5	0.1	1.4	1.8	1.1			
West Virginia.....	542.6	28.8	399.1	561.8	28.7	514.3	49.8	38.0	7.6	99.1	99.2	96.3	0.9	0.8	3.7	0.6	0.6	0.2	0.6	0.6	0.3	0.1	0.1	0.2			
North Carolina.....	1,486.4	194.1	439.3	2,227.0	209.4	652.2	193.0	74.9	67.5	93.3	88.7	63.6	6.7	11.3	36.4	1.2	0.6	0.2	1.1	0.5	0.1	1.9	1.8	1.9			
South Carolina.....	247.9	10.0	286.4	253.6	-11.3	298.5	131.9	66.2	39.5	96.9	98.3	95.3	3.1	1.7	4.7	1.0	1.6	0.8	1.0	1.6	0.8	0.8	0.8	1.0			
Georgia.....	208.8	14.2	170.5	222.9	9.6	194.6	130.8	68.3	37.2	88.5	92.2	84.7	11.5	7.8	15.3	0.7	0.9	0.7	0.7	0.9	0.6	2.0	2.0	2.6			
Florida.....	422.7	111.5	147.1	559.0	127.6	189.3	287.8	88.8	105.4	62.7	58.3	49.8	37.3	41.7	50.2	0.3	0.2	0.1	0.2	0.1	0.1	2.5	2.2	1.9			
East South Central:																											
Kentucky.....	215.9	66.0	90.3	223.1	67.0	93.5	80.1	38.2	30.3	97.1	96.5	94.9	2.9	3.5	5.1	1.1	0.9	0.9	1.1	0.9	0.9	0.7	0.9	1.2			
Tennessee.....	743.1	52.6	452.5	824.6	54.4	498.7	96.9	5.9	85.9	97.4	96.2	88.8	2.6	3.8	11.2	2.1	1.9	0.7	2.1	1.9	0.6	1.3	2.0	2.0			
Alabama.....	404.5	321.7	19.6	426.5	349.2	17.2	98.4	29.3	53.4	97.4	91.4	93.3	2.6	8.6	6.7	1.2	0.4	0.7	1.2	0.4	0.7	0.8	1.0	1.1			
Mississippi.....	111.1	-6.2	125.7	139.6	-17.0	188.7	70.7	28.4	33.0	67.3	76.1	59.5	32.7	23.9	40.5	0.1	0.2	0.2	0.1	0.2	0.1	1.2	1.5	2.1			
West South Central:																											
Arkansas.....	445.5	118.0	150.3	533.4	124.8	181.7	128.2	67.0	36																		

In four states—South Carolina, Mississippi, Idaho, and Colorado—there has been a slight decrease in the amount of investment in commercial plants since 1912. This is in some cases due to the different method of handling the accounts at the later period, while in others it is occasioned by changes in ownership which have resulted in combining the balance sheets of electric companies with street railway systems. In some instances, also, there has been a change in ownership from commercial to municipal, which partially accounts for the decrease. All states report an increase in the investment of municipal plants since 1912.

The investment in municipal stations forms the highest per cent of the total in Florida (37.3 per cent), Mississippi (32.7 per cent), Washington (19.7 per cent), Kansas (15.3 per cent), Oklahoma (11.6 per cent), and Georgia (11.5 per cent). In no other states is the amount equal to 10 per cent of the total. It must be further noted that two divisions—the New England and the East South Central—show a decrease since 1912 in the relative amount of municipal plant investment, while 19 different states show a similar decrease. In 4 states the proportion remains as in 1912, while the remaining 25 show an increase which in some cases is very slight. There are 26 states which report a decrease in the relative importance of municipal plant investment since 1907.

On account of the wide differences which prevail, not only among plants under the same form of ownership but also under commercial and municipal ownership, it is doubtful whether statistics showing the average value per station have any great significance. Such figures, however, are highly interesting and probably indicate the general condition with a reasonable degree of accuracy. The average investment per commercial station in 1917 was \$694,370 as compared with an average of \$573,548 in 1912, \$304,458 in 1907, and \$172,093 in 1902. Municipal

plants at the same dates report average investments of \$54,950, \$49,337, \$34,249, and \$27,019. It appears, therefore, that while the average investment in commercial stations has more than quadrupled since 1902, the investment in municipal stations has merely doubled since that date.

Table 74

		AVERAGE VALUE OF COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS: 1917, 1912, 1907, AND 1902.		
		All stations.	Generating stations.	Purchasing stations.
1917:				
Commercial.....		\$694,370	\$850,812	\$97,321
Municipal.....		54,950	58,951	41,809
1912:				
Commercial.....		573,548	611,396	295,941
Municipal.....		49,337	47,367	69,997
1907:				
Commercial.....		304,458	(¹)	(¹)
Municipal.....		34,249	(¹)	(¹)
1902:				
Commercial.....		172,093	(¹)	(¹)
Municipal.....		27,019	(¹)	(¹)

¹ Figures not available.

For 1912 and 1917 it has been possible to separate the investment accounts of plants purchasing all of their current from those which generate current. On the basis of this separation it appears, as shown in Table 74, that the average investment in commercial generating stations in 1917 was markedly higher than that in the purchasing stations, \$850,812 as opposed to \$97,321. The difference between the two classes of stations was not great in the case of the municipally owned plants. In 1912, however, the average investment in commercial purchasing stations was almost half as great as in the generating stations. This condition is occasioned almost wholly by the fact that one or two very large plants in the state of New York were in 1912 purchasing all of their current, while in 1917 they were generating a portion of their output. It is also true that there has been under both classes of ownership a considerable growth in the number of small purchasing plants since 1912.

Table 75

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—VALUE OF PLANT AND EQUIPMENT; AVERAGE VALUE PER KILOWATT CAPACITY OF DYNAMOS AND PER HORSEPOWER OF PRIMARY POWER MACHINES: 1917, 1912, AND 1907.									
	Total.			Commercial.			Municipal.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907
Number of stations.....	6,542	5,221	4,714	4,224	3,659	3,462	2,318	1,562	1,252
Generating all or part of current.....	5,124	4,046	4,487	3,347	3,220	(¹)	1,777	1,426	(¹)
Purchasing all current.....	1,418	1,175	227	877	439	(¹)	541	136	(¹)
Value of plant and equipment.....	\$3,080,392,141	\$2,175,678,266	\$1,096,913,622	\$2,933,016,941	\$2,068,613,122	\$1,054,034,175	\$1,273,375,200	\$77,065,144	\$42,879,447
Plants generating all or part of current.....	\$2,952,423,577	\$2,036,240,492	(¹)	\$2,847,666,813	\$1,968,695,006	(¹)	\$1,044,756,764	\$67,545,486	(¹)
Plants purchasing all current.....	\$107,968,564	\$139,437,774	(¹)	\$85,350,128	\$129,918,116	(¹)	\$22,618,436	\$9,519,658	(¹)
Kilowatt capacity of dynamos.....	8,994,407	5,165,439	2,709,225	8,411,944	4,768,762	2,500,309	582,463	396,677	209,016
Average value per kilowatt capacity of dynamos for all stations.....	\$340	\$421	\$405	\$349	\$440	\$422	\$219	\$194	\$205
Average value for generating stations only.....	\$328	\$394	(¹)	\$336	\$413	(¹)	\$180	\$170	(¹)
Horsepower of primary power machines.....	12,936,755	7,530,044	4,098,188	12,077,657	6,970,716	3,776,837	859,098	559,328	321,351
Average value per horsepower of primary power machines for all stations.....	\$237	\$299	\$268	\$243	\$301	\$279	\$148	\$138	\$133
Average value for generating stations only.....	\$228	\$270	(¹)	\$236	\$282	(¹)	\$122	\$121	(¹)

¹ Not reported.

In Table 75 is shown the number of commercial and municipal stations at the last three census periods, classified according to whether they generate current or purchase all current, together with the value of

plant and equipment and the average value per kilowatt capacity of dynamos and per horsepower of prime movers. At the earlier census periods no attempt was made in computing this average invest-

ment to separate those plants not supplied with generating equipment from those which had such equipment. Accordingly, the per capacity investment figures were unduly high. The separation, however, has been made for 1912 and 1917, as indicated in the table. Owing to the small number and relative unimportance of purchasing stations in 1907, the combined figures for that date also are approximately correct. For the sake of comparison with earlier censuses the average value per kilowatt and per horsepower, based on the total value of all stations, is given along with the true value for generating plants only, computed for 1912 and 1917. The latter figures alone have any real significance.

The average value per kilowatt capacity for generating plants only has decreased since 1912 from \$394 to \$328 in 1917. If the generating equipment not in use at this period, reported by those plants which purchased all of their current and amounting to 50,984 kilowatts, were to be deducted from the total capacity of dynamos returned for all stations, the average figure for 1917 would be about \$330 per kilowatt. Since, however, no separate statistics of this equipment not in use are at hand for commercial and municipal plants taken separately, it is scarcely worth while to mention this negligible difference. A similar decrease in average value per horsepower of prime movers is to be noted since 1912, from \$270 to \$228.

The general decrease in per capacity value indicated for recent years may be explained by some of the following considerations: First, the installation of larger units, which cost relative to their size less than the smaller units and which require less space for installation, etc., has led to economies in investment resulting in a lower average per kilowatt and per horsepower. Secondly, after generating plants have been properly constructed the installation of new generating units to meet the needs of developing business does not necessarily entail any appreciable increase in the investment in buildings or in much of the central station equipment. Hence a natural decrease in per capacity investment may be expected in case of normal growth. Again, on account of the high prices which prevailed during the past two or three years of the period, it is probable that every effort was made to reduce capital outlays to a minimum, even though, on account of the increased demand for electric service, it was necessary to install new generating equipment. Finally, it must be remembered that for this census, as previously stated, the schedules call for the *value* of plant and equipment instead of the *cost* of plant and equipment, as was the case at earlier periods. Accordingly, central stations are at liberty to return the depreciated value of their plants, and no doubt the investment figures secured are correspondingly lower than they were in 1912 and 1907. The increasing number of very large

generating stations has also been significant in this connection because of the elimination of needless duplication in buildings, equipment, etc. Other considerations may be involved, but these would seem to be sufficient to account for the changes.

These general suggestions apply particularly to the commercial stations which have decreased their value per kilowatt capacity from \$413 in 1912 to \$339 in 1917. Municipal plants appear not to have conformed to the general rule, since they report an actual increase of investment per kilowatt from \$170 in 1912 to \$180 in 1917. This increase is too slight to be of much significance, but it may be suggested that plants under this form of ownership would not necessarily be influenced by the same motives which probably led to economies in investment during the last few years in commercial plants. Municipal stations do not have dividends to pay, and municipal bonds have been particularly in demand during the period of heavy income taxes, when it has been easy for such plants to increase their capital accounts. Further, many municipal plants appear to have been passing through a stage of development and expansion which was reached by commercial stations a good many years ago and which, accordingly, has necessitated a relatively heavier capital investment. Finally, the more rapid increase in the number of municipal generating stations, 24.6 per cent, since 1912, as opposed to 3.9 per cent for commercial stations during the same period, has occasioned duplication of buildings and equipment and other wastes in investment which are unavoidable when small generating stations are numerous.

Reasons for the lower actual per capacity investment in municipal stations at all periods have already been given. Not only are the figures in many cases questionable, but even when they are accurate it must be remembered that, owing to the restricted nature of their business and the limited territory which they serve, their capital outlays will naturally be much lower than those of commercial stations.

EXPENSES.

Classified expenses.—The method of reporting expenses of central electric light and power stations has been practically the same at the last two census periods, though, on account of the different requirements in 1902 and 1907, it is impossible to make detailed comparisons with the figures collected at the earlier dates. In order to secure as full a statement as possible, electric stations have been required to return not merely their ordinary expenses of operation and maintenance, together with taxes, but also those charges for interest, depreciation, and sinking fund requirements, which are, in accordance with the usual accounting practice, regarded as deductions from net income. There is, of course, some difference of opinion as to whether, in comparing the financial

results of operation of commercial and municipal plants, it is proper to include all of these charges under operating expenses. This is particularly true of the payments to the sinking fund made by publicly owned plants with a view to retiring their bonded indebtedness within a fixed period. Such a policy is not ordinarily followed by commercial stations. But in every case the two groups will be uniformly handled for comparative purposes, and it will be possible for the student of the problem to separate particular items from the general expenses in making any analyses which he may have in mind.

In Table 76 expenses are shown in detail for 1917 and 1912, together with the relative importance of the various items for all stations as well as for commercial

and municipal plants taken separately and the per cent of increase during the period. It appears that the expenses have increased more rapidly during the last five years than the income, 81.8 per cent as opposed to 74.3 per cent. A number of items also have been subject to an unusually marked increase. The most important of these are the following: Fuel, 150.2 per cent; taxes, 128.6 per cent; and electric current purchased, 114.8 per cent. The rapid growth in expenditures for rentals of different sorts (133.2 per cent) is probably deserving of little comment. The relatively greatly increased charges for sinking funds and reserve funds (184.3 per cent) indicate a more cautious financial policy as regards the future of central stations.

Table 76

Table 76	CENTRAL ELECTRIC STATIONS—EXPENSES, WITH PER CENT OF INCREASE AND PER CENT DISTRIBUTION: 1917 AND 1912.									
	ACCOUNT.	Amount.		Per cent of increase.	Per cent distribution.					
					All stations.		Commercial.		Municipal.	
		1917	1912		1917	1912	1917	1912	1917	1912
Total expenses.....	\$426,568,307	\$234,577,277	81.8	100.0	100.0	100.0	100.0	100.0	100.0	
Fuel.....	87,272,088	34,877,297	150.2	20.5	14.9	19.8	14.0	28.6	25.8	
Electric current and electric power purchased.....	58,818,430	18,074,344	114.8	9.1	7.7	9.0	7.8	9.8	6.9	
Rent of offices, conduits, underground and water privileges.....	9,978,834	4,279,596	133.2	2.3	1.8	2.5	1.9	0.3	0.4	
Supplies, materials, and other miscellaneous expenses, not elsewhere specified.....	63,119,932	30,714,823	73.0	12.5	13.1	12.2	12.7	16.0	18.6	
Salaries and wages.....	95,241,858	61,161,941	55.7	22.3	26.1	21.9	25.6	27.9	32.5	
Taxes (total).....	30,062,962	13,147,338	128.6	7.1	5.5	7.6	6.0	0.5	0.2	
Real and personal property.....	15,585,614	8,048,291	93.6	3.7	3.4	.....	.....	.....	.....	
Capital stock.....	1,307,378	997,012	31.1	0.3	0.4	.....	.....	.....	.....	
Federal corporation.....	4,603,232	558,706	723.9	1.1	0.2	.....	.....	.....	.....	
Earnings.....	5,133,526	2,598,338	97.6	1.2	1.1	.....	.....	.....	.....	
Miscellaneous.....	3,433,212	944,991	263.3	0.8	0.4	.....	.....	.....	.....	
Injuries and damages.....	1,697,391	1,200,989	41.3	0.4	0.5	0.4	0.5	0.2	0.3	
Insurance.....	3,783,065	2,320,151	63.0	0.9	1.0	0.9	1.0	0.8	0.9	
Interest on funded and floating debt.....	73,584,279	48,302,900	52.3	17.2	20.6	18.0	21.5	7.8	8.5	
Charges for depreciation.....	28,307,104	18,843,863	50.2	6.6	8.0	6.7	8.3	6.4	5.1	
Charges for sinking and reserve funds.....	4,702,364	1,654,035	184.3	1.1	0.7	1.0	0.7	1.7	0.8	

Attention should be called to the per cent which the different items formed of the total outlays of the two groups of plants in 1917 and 1912. The most significant change in this respect for commercial plants is found in the cost of fuel, which in 1912 formed only 14 per cent of all expenses, while in 1917 it amounted to 19.8 per cent. These figures suggest a greatly increased price of fuel during the period. It is interesting to note, however, that municipal stations have not been subject to so great a change in this regard, as the increase has been only from 25.8 per cent in 1912 to 28.6 per cent in 1917. Possibly municipal stations in many cases profit by a relatively lower rate on coal, which is purchased in large quantities for general municipal uses. In both groups of stations the relative importance of salaries and wages in the annual outlays has decreased markedly, while there has also been a percentage decrease in expenditures for interest. The fact that at both periods the payments made by commercial plants for supplies, materials, etc., form a much lower percentage of the total than is found in municipal stations may indicate that the former sometimes follow the policy of charging to the capital account certain outlays for renewals, better-

ments, etc., which the latter are disposed to charge against income.

In order to show the increase in expenses for commercial and municipal stations since 1907 as well as the per cent which the items reported by each group form of the total for corresponding items reported by all stations, Table 77 has been prepared, with total expenses divided into only four groups.

The groups shown in Table 77 are no longer particularly illuminating because not sufficiently detailed. It does appear, however, that there has been little change during the past 10 years in the relative percentage of the total expenses reported by the commercial plants. Their outlays for fuel have increased from 86 per cent of the combined expenditure for this item in 1907 to 89.7 per cent in 1917. There has, on the other hand, been a drop in the proportion paid for purchased current from 94.8 per cent to 92.1 per cent. The outlays for supplies and materials, including salaries and wages, have continued at practically the same ratios. The proportionate outlays of municipal plants are relatively highest for fuel and lowest for rents and fixed charges, etc.

Table 77

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—EXPENSES: 1917, 1912, AND 1907.

CLASS.	Total.	Commer- cial.	Municipal.	Per cent of total.	
				Com- mer- cial.	Mun- ici- pal.
Number of stations:					
1917.....	6,542	4,224	2,318	64.6	35.4
1912.....	5,221	3,559	1,662	70.1	29.9
1907.....	4,714	3,462	1,252	73.4	26.6
Total expenses:					
1917.....	\$426,568,307	\$395,127,395	\$31,440,912	92.6	7.4
1912.....	284,577,277	217,660,112	16,917,165	92.8	7.2
1907.....	134,196,911	123,880,291	10,316,620	92.3	7.7
Rent of offices, conduits, and water privileges; taxes, interest on funded and floating debt, injuries and damages, insurance, and charges for depreciation and sinking fund:					
1917.....	152,115,999	146,516,827	5,599,172	96.3	3.7
1912.....	89,748,872	87,022,175	2,726,697	97.0	3.0
1907.....	51,061,122	49,434,241	1,626,881	96.8	3.2
Cost of fuel:					
1917.....	87,272,088	78,286,011	8,986,077	89.7	10.3
1912.....	34,877,297	30,501,988	4,375,309	87.5	12.5
1907.....	23,057,745	19,824,962	3,232,783	86.0	14.0
Cost of electric power purchased:					
1917.....	38,818,430	35,733,235	3,085,195	92.1	7.9
1912.....	18,074,844	16,912,612	1,161,732	93.6	6.4
1907.....	6,417,237	6,080,905	336,332	94.8	5.2
Supplies and materials, including salaries and wages, and other expenses not elsewhere included:					
1917.....	148,361,790	134,591,322	13,770,468	90.7	9.3
1912.....	91,876,764	83,223,337	8,653,427	90.6	9.4
1907.....	53,660,807	48,540,183	5,120,624	90.5	9.5
PER CENT OF INCREASE.					
Number of stations:					
1907-1917.....	38.8	22.0	85.1		
1912-1917.....	25.3	15.4	48.4		
1907-1912.....	10.8	5.7	24.8		
Total expenses:					
1907-1917.....	217.9	219.0	204.8		
1912-1917.....	81.8	81.5	85.8		
1907-1912.....	74.8	75.7	64.0		
Rent of offices, conduits, and water privileges; taxes, interest on funded and floating debt, injuries and damages, insurance, and charges for depreciation and sinking fund:					
1907-1917.....	197.9	196.4	244.2		
1912-1917.....	69.5	68.4	105.3		
1907-1912.....	75.8	76.0	67.6		
Cost of fuel:					
1907-1917.....	278.5	294.9	178.0		
1912-1917.....	150.2	156.6	105.4		
1907-1912.....	51.3	53.8	35.3		
Cost of electric power purchased:					
1907-1917.....	504.9	487.6	817.3		
1912-1917.....	114.8	111.3	165.6		
1907-1912.....	181.7	178.1	245.4		
Supplies and materials, including salaries and wages, and other expenses not elsewhere included:					
1907-1917.....	176.5	177.3	168.9		
1912-1917.....	61.5	61.7	59.1		
1907-1912.....	71.2	71.4	69.0		

Fuel.—The outlays for fuel amount to about one-fifth of the total expenses of commercial plants and considerably more than one-fourth of the expenses of municipal plants. Hence, in view of the increasing importance of this item, some mention should be made of the quantity and kind of fuel used by the two groups of plants, as well as of the cost. From Table 78 it appears that bituminous coal is almost the only kind of fuel used in the New England states, as well as in the East South Central division. In the Middle Atlantic states, however, in addition to bituminous

coal, a very large quantity of anthracite is used, about three-tenths of the total tonnage of coal consumed. In no other division is anthracite of any importance, and the East South Central division reports no anthracite whatever. The East North Central division reports the highest amount of bituminous coal as well as next to the largest quantity of gas, a large proportion of which is probably natural gas. In the West North Central, South Atlantic, and Mountain divisions it appears that practically every kind of fuel is used, but particularly bituminous coal, oil, and gas. The West South Central and Pacific divisions use oil and gas to the practical exclusion of other kinds of fuel. A very small amount of coke is used in all divisions except the West South Central and the Pacific. There are in addition a number of small plants, particularly in the South Atlantic and East South Central divisions, which use, wholly or in part, wood and refuse from sawmills, which are frequently obtainable in place of the commoner kind of fuel at extremely low cost.

The highest outlays for fuel are found, as might be expected, in the Middle Atlantic and East North Central divisions. Commercial plants expend the most for this item in the states of Pennsylvania (\$11,862,075), New York (\$10,442,556), and Illinois (\$8,296,638). Municipal plants report the highest outlay for fuel in Ohio (\$981,433), Michigan (\$680,606), Indiana (\$611,262), Minnesota (\$538,722), Kansas (\$533,201), and Massachusetts (\$475,016).

Many plants report several different kinds of fuel, and as the census did not ask for the actual quantity of fuel used until 1917, some of the figures returned may be open to question. This is probably true of the reported consumption of oil, which was returned only by "barrels," but not reduced to a standard number of gallons per barrel. On account of the conditions which exist, it is obviously impossible to give the average cost of the different kinds of fuel either by states or divisions. It was found, however, as a result of special investigation, that prices for what appeared to be the same quality of fuel varied to an unusual degree, depending upon the nearness to sources of supply, the existing transportation facilities, the size of plants, and the terms of contracts which had been entered into with dealers in fuel. Some large stations, securing their supply of coal, for example, under five-year contract, may have paid no more per ton in 1917 than in 1912, while others not so fortunately situated felt the full burden of the increased prices. At any rate, it was found that the tonnage rate even for bituminous coal varied from \$2 or \$3 to \$12, and even more. The average rate for the year, however, may be fairly said to have been from \$3.50 to \$4 for a representative station. The price of oil was subject to an even greater fluctuation than that of coal. Some small stations in North Dakota or Montana reported a price as high as \$12

to \$15 per barrel as a result of abnormal conditions, while others near the large oil fields in Texas, Oklahoma, and California did not pay more than 50 or 60 cents per barrel. Finally, the reported price of gas also varied between wide extremes. One or two munici-

palities located in the vicinity of natural-gas wells actually received their supply practically without charge, though the usual rates varied from a minimum of 10 to about 20 cents per 1,000 cubic feet. Much higher rates, however, are frequently found.

CENTRAL ELECTRIC STATIONS—FUEL CONSUMED: 1917.

Table 78

	Total cost of fuel.	COAL.		Coke (tons of 2,000 lbs.).	Oil (barrels).	Gas (1,000 cu. ft.).
		Anthracite (tons of 2,240 lbs.).	Bituminous (tons of 2,000 lbs.).			
UNITED STATES.....	\$87,272,088	2,180,183	19,385,090	63,137	6,158,219	14,199,204
GEOGRAPHIC DIVISIONS:						
New England.....	8,561,287	32,046	1,329,864	8,593	8,203	3,100
Maine.....	57,312	263	5,601	418		
Commercial.....	53,886	249	5,006	418		
Municipal.....	3,426	14	595			
New Hampshire.....	341,140	5,261	40,373	253		
Commercial.....	332,730	5,261	39,483	253		
Municipal.....	8,410		890			
Vermont.....	88,162	91	11,345			
Commercial.....	56,320	91	7,004			
Municipal.....	31,842		4,341			
Massachusetts.....	4,589,175	7,281	819,662	6,033	1,934	
Commercial.....	4,114,159	3,126	755,965	6,033	1,593	
Municipal.....	475,016	4,155	63,697		341	
Rhode Island.....	1,160,609	1,072	159,767	730	2,367	
Commercial.....	1,160,609	1,072	159,767	730	2,367	
Municipal.....						
Connecticut.....	2,324,889	18,078	293,116	1,830	3,231	3,100
Commercial.....	2,251,198	17,753	281,763	730		
Municipal.....	73,691	325	11,353	1,100	3,231	3,100
MIDDLE ATLANTIC.....	27,869,061	2,129,558	5,192,831	12,259	15,074	730,422
New York.....	10,724,411	164,474	2,099,625	10,986	9,148	50,812
Commercial.....	10,442,556	162,539	2,049,235	10,986	8,378	14,736
Municipal.....	281,855	1,935	50,390		770	36,076
New Jersey.....	5,081,144	849,807	95,443		4,440	10
Commercial.....	5,019,326	843,081	90,488		2,229	
Municipal.....	61,818	6,726	4,955		2,211	10
Pennsylvania.....	12,063,506	1,115,277	2,997,763	1,273	1,486	679,600
Commercial.....	11,862,075	1,093,506	2,959,478	1,273	1,435	607,488
Municipal.....	201,431	21,771	38,285		51	72,112
EAST NORTH CENTRAL.....	25,648,006	3,060	7,836,061	8,851	235,255	2,816,504
Ohio.....	7,077,282	128	1,603,980		12,416	2,793,792
Commercial.....	6,095,849	128	1,360,648		3,322	2,600,631
Municipal.....	981,433		243,332		9,094	193,161
Indiana.....	2,839,852	670	1,173,398	30	5,465	22,712
Commercial.....	2,228,590	180	951,934	30	4,763	21,232
Municipal.....	611,262	490	221,464		702	1,480
Illinois.....	8,739,918	200	3,298,203		18,651	
Commercial.....	8,296,638	200	3,150,983		13,133	
Municipal.....	443,280		147,220		5,518	
Michigan.....	5,252,214	1,172	1,244,220	2,964	6,302	
Commercial.....	4,571,608	210	1,097,531	2,964	3,579	
Municipal.....	680,606	962	146,689		2,723	
Wisconsin.....	1,738,740	890	516,260	5,857	192,421	
Commercial.....	1,469,277	550	463,557	5,857	189,871	
Municipal.....	269,463	340	52,703		2,550	
WEST NORTH CENTRAL.....	10,450,544	9,393	2,315,879	19,244	984,376	1,374,694
Minnesota.....	1,877,056	3,143	361,374	719	18,118	25,535
Commercial.....	1,338,334	1,336	261,080	719	12,106	25,535
Municipal.....	538,722	1,807	100,294		6,012	
Iowa.....	1,713,904	567	450,847	261	31,508	300
Commercial.....	1,287,790		353,025	93	17,021	300
Municipal.....	426,114	567	97,822	168	14,487	
Missouri.....	2,552,184		719,576	664	265,874	219
Commercial.....	2,150,361		602,577	104	240,878	219
Municipal.....	401,823		116,999	560	24,996	
North Dakota.....	526,888	1,329	143,943		11,790	
Commercial.....	464,833	1,329	133,438		9,412	
Municipal.....	62,055		10,505		2,378	
South Dakota.....	442,329	4,022	57,834		32,526	120,000
Commercial.....	318,643	1,585	47,936		26,223	120,000
Municipal.....	123,686	2,437	9,898		6,303	
Nebraska.....	1,315,626	332	279,428	78	96,505	7,500
Commercial.....	964,081		218,177	78	74,956	7,500
Municipal.....	351,545	332	61,251		21,549	
Kansas.....	2,022,557		302,877	17,522	528,055	1,221,140
Commercial.....	1,489,356		221,377	17,522	360,032	861,323
Municipal.....	533,201		81,500		168,023	359,817
SOUTH ATLANTIC.....						
Delaware, Maryland, and District of Columbia.....	\$4,644,437	5,200	1,090,738	5,632	230,720	1,116,076
Commercial.....	1,335,320	2,082	359,549	956	1,882	51,834
Municipal.....	1,240,797	2,082	343,076		604	51,834
Virginia.....	94,523		16,473	956	1,278	
Commercial.....	319,326	104	89,961		1,853	
Municipal.....	252,294	104	77,121		1,510	
West Virginia.....	67,032		12,840		343	
Commercial.....	763,165	1,200	281,794		144	1,063,902
Municipal.....	740,938	1,200	274,582		144	1,059,076
Municipal.....	22,227		7,212			7,826
North and South Carolina.....	1,239,870		263,033	4,333	4,056	
Commercial.....	947,924		208,085	4,333	2,322	
Municipal.....	291,946		54,948		1,734	
Georgia.....	490,847	1,714	79,794		2,660	
Commercial.....	216,060	1,714	44,031		2,577	
Municipal.....	274,787		35,763		2,403	
Florida.....	495,909	100	16,607	343	220,125	340
Commercial.....	278,467		10,697	343	93,573	340
Municipal.....	217,442	100	5,910		126,552	
EAST SOUTH CENTRAL.....	2,059,792		722,407	2,499	14,748	42,733
Kentucky.....	689,161		282,671	2,258	9,779	42,733
Commercial.....	596,367		240,186	1,164	9,426	42,733
Municipal.....	92,794		42,485	1,094	353	
Tennessee.....	585,492		200,519	115	962	
Commercial.....	423,813		133,510	115	334	
Municipal.....	161,679		67,009		628	
Alabama.....	415,760		152,633	126	698	
Commercial.....	324,739		133,732	126	298	
Municipal.....	91,021		18,921		400	
Mississippi.....	369,379		86,564		3,309	
Commercial.....	218,081		47,050		2,252	
Municipal.....	151,298		39,514		1,057	
WEST SOUTH CENTRAL.....	3,386,078	150	374,909	1,603,561	6,621,909	
Arkansas.....	395,784		79,457		10,275	920,777
Commercial.....	307,283		63,143		7,540	824,986
Municipal.....	88,501		16,314		2,735	95,791
Louisiana.....	298,856		25,002		61,166	384,573
Commercial.....	158,879		11,576		43,351	384,500
Municipal.....	139,977		13,426		17,815	73
Oklahoma.....	834,404		82,796		116,738	4,260,818
Commercial.....	566,316		38,986		90,124	3,829,515
Municipal.....	268,088		43,810		26,614	431,303
Texas.....	1,857,034	150	187,654		1,415,382	1,055,741
Commercial.....	1,741,923		144,987		1,389,853	1,055,741
Municipal.....	115,111	150	42,667		25,529	
MOUNTAIN.....	1,545,131	661	511,138	6,059	253,666	196,102
Montana.....	165,284	169	49,493	5,103	5,299	4,291
Commercial.....	116,480	169	33,083	5,103	3,728	4,291
Municipal.....	48,804		16,410		1,571	
Idaho.....	7,954		660		310	
Commercial.....	6,877		660		90	
Municipal.....	1,077				220	
Wyoming.....	217,346		80,745		60,502	191,811
Commercial.....	204,216		79,152		59,676	169,165
Municipal.....	13,130		1,593		826	22,646
Colorado.....	575,339		306,622		1,540	
Commercial.....	535,877		294,649		567	
Municipal.....	39,462		11,973		973	
New Mexico.....	228,533	492	58,946	16	6,707	
Commercial.....	212,364		57,007	16	5,292	
Municipal.....	16,169	492	1,939		1,415	
Arizona.....	289,342		2,615	915	168,122	
Commercial.....	284,879		2,615	915	167,992	
Municipal.....	4,463				130	
Utah.....	22,617		10,329			
Commercial.....	17,307		7,234			
Municipal.....	5,310		3,095			
Nevada.....	38,716		1,728	25	11,186	
Commercial.....	38,716		1,728	25	11,186	
Municipal.....						
PACIFIC.....	3,107,752	115	11,263	2,812,616	1,297,664	
Washington.....	200,042	115	10,713		91,593	
Commercial.....	88,105	115	10,133		15,542	
Municipal.....	111,937		580		76,051	
Oregon.....	143,679		550		39,365	
Commercial.....	134,760		550		38,442	
Municipal.....	8,919				923	
California.....	2,764,031			2,681,658	1,297,664	
Commercial.....	2,664,330			2,583,114	1,297,664	
Municipal.....	99,701			98,544		

Cost of purchased current.—Though the price of current purchased does not form so large a proportion of the total outlays as do some other items, it is more readily reducible to standard units. Hence it has been thought worth while to compute the average rates paid in the different geographic divisions by

both commercial and municipal stations. First, however, it may be interesting to present figures covering the entire purchase of electric current in the United States for both central stations and electric railways. In Table 79 these relations are shown.

Table 79

DIVISION. ¹	Census year.	CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—PURCHASED CURRENT, KILOWATT HOURS, AND AMOUNT PAID FOR PURCHASED CURRENT, BY GEOGRAPHIC DIVISIONS: 1917 AND 1912.								
		Total. ²			Central electric stations.			Electric railways.		
		Purchased current, kilowatt hours.	Amount paid for purchased current.	Average cost per kilowatt hour (cents).	Purchased current, kilowatt hours.	Amount paid for purchased current.	Average cost per kilowatt hour (cents).	Purchased current, kilowatt hours.	Amount paid for purchased current. ³	Average cost per kilowatt hour (cents).
United States.....	1917	10,553,094,004	\$81,664,687	0.8	5,605,745,962	\$38,818,430	0.7	4,947,348,042	\$42,846,257	0.9
	1912	5,630,861,358	42,778,673	0.8	2,613,502,605	18,074,344	0.7	3,017,358,753	24,704,329	0.8
New England.....	1917	771,186,984	7,762,019	1.0	578,110,359	5,422,171	0.9	193,076,125	2,339,848	1.2
	1912	232,382,012	2,818,501	1.2	136,821,236	1,394,330	1.0	95,560,776	1,424,171	1.5
Middle Atlantic.....	1917	3,550,175,198	29,501,269	0.8	1,917,380,779	12,059,998	0.6	1,632,794,419	17,441,271	1.1
	1912	1,884,722,386	13,778,379	0.7	989,494,314	5,982,590	0.6	895,318,072	7,795,789	0.9
East North Central.....	1917	2,046,026,703	16,306,258	0.8	615,605,822	6,363,690	1.0	1,430,420,881	9,942,568	0.7
	1912	1,073,512,511	9,584,184	0.9	276,742,512	2,933,041	1.0	796,769,999	6,651,148	0.8
West North Central.....	1917	1,066,035,177	8,130,403	0.8	790,508,038	5,717,411	0.7	275,527,139	2,412,992	0.9
	1912	383,167,448	3,945,449	1.0	183,535,438	2,135,944	1.1	199,632,010	1,809,505	0.9
South Atlantic.....	1917	839,261,940	5,216,813	0.6	416,165,334	2,477,242	0.6	423,096,706	2,739,371	0.6
	1912	706,663,569	3,364,814	0.5	407,716,558	1,831,265	0.4	298,947,301	1,538,549	0.5
East South Central.....	1917	568,459,551	1,949,704	0.3	355,590,851	773,401	0.2	237,868,700	1,176,303	0.6
	1912	57,811,414	507,933	0.9	15,948,772	131,697	0.8	41,862,642	376,236	0.9
West South Central.....	1917	228,053,605	2,324,594	1.0	157,603,726	1,282,263	0.8	79,449,880	1,042,311	1.5
	1912	92,487,788	952,253	1.0	38,763,468	311,664	0.8	53,724,320	640,589	1.2
Mountain.....	1917	420,967,558	2,321,096	0.6	338,811,725	1,456,939	0.4	82,155,833	834,157	1.0
	1912	259,796,097	1,590,136	0.6	188,201,530	1,032,516	0.5	71,594,567	557,620	0.8
Pacific.....	1917	1,067,927,288	8,152,731	0.8	436,968,929	3,235,295	0.7	631,958,359	4,917,436	0.8
	1912	940,317,743	6,237,024	0.7	376,368,677	2,321,297	0.6	563,949,066	3,915,727	0.7

¹ See p. 18 for states composing the several geographic divisions.

² Includes a small amount paid for power other than electric in 1912.

Central stations purchased 53.1 per cent of all current in 1917 and only 46.4 per cent in 1912. At the same dates their outlay for purchased current comprised 47.5 per cent and 42.3 per cent of the aggregate amount paid for purchased current. At each date the average rate paid by central stations was only seven-tenths of 1 cent, while the average for electric railways was eight-tenths of 1 cent in 1912, increasing to nine-tenths of 1 cent in 1917. The lowest average rate reported for central stations in 1917 was two-tenths of 1 cent in the East South

Central division, while the highest rate, 1 cent, is found in the East North Central division. For electric railways the lowest average rate, six-tenths of 1 cent, is in the East South Central and the South Atlantic divisions, while the highest rate, 1.5 cents, is reported for the West South Central division.

In Table 80 is shown the number of commercial and municipal central stations which purchased all their current, as well as the number of kilowatt hours purchased, the amount paid, and the average cost per kilowatt hour.

Table 80

DIVISION.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF STATIONS PURCHASING ALL CURRENT AND AMOUNT AND COST OF PURCHASED CURRENT, BY GEOGRAPHIC DIVISIONS: 1917.											
	Total.				Commercial.				Municipal.			
	Number of stations.	Kilowatt hours purchased.	Amount paid for purchased current.	Average cost per kilowatt hour (cents).	Number of stations.	Kilowatt hours purchased.	Amount paid for purchased current.	Average cost per kilowatt hour (cents).	Number of stations.	Kilowatt hours purchased.	Amount paid for purchased current.	Average cost per kilowatt hour (cents).
United States.....	1,418	1,236,670,848	\$12,966,451	1.1	877	1,074,545,276	\$10,479,167	1.0	541	162,125,572	\$2,517,284	1.6
New England.....	141	144,754,181	1,790,565	1.2	107	135,425,710	1,567,674	1.2	34	9,328,471	222,891	2.4
Middle Atlantic.....	202	430,451,842	3,785,840	0.9	174	420,533,674	3,632,261	0.9	28	9,918,168	153,579	1.5
East North Central.....	324	267,389,624	3,144,484	1.2	199	197,237,840	2,301,206	1.2	125	70,151,784	843,278	1.2
West North Central.....	341	153,162,909	1,479,171	1.0	141	136,269,850	981,163	0.7	200	16,893,059	548,008	3.2
South Atlantic.....	170	66,527,318	876,800	1.3	79	39,885,454	494,162	1.2	91	29,641,864	382,638	1.3
East South Central.....	26	18,470,623	220,057	1.2	19	17,391,411	190,245	1.1	7	1,079,212	29,812	2.8
West South Central.....	44	43,941,915	495,866	1.1	33	40,357,001	418,168	1.0	11	3,584,914	77,698	2.2
Mountain.....	79	36,845,353	447,762	1.2	59	33,204,041	383,371	1.2	20	3,641,312	64,391	1.8
Pacific.....	91	72,127,083	755,906	1.0	66	54,240,295	560,917	1.0	25	17,886,788	194,989	1.1

The figures in Table 80, it must be remembered, cover only a small portion of all current purchased by central stations, 1,236,670,848 kilowatt hours out

of a total of 5,605,745,962 kilowatt hours. Hence it is apparent that, as a rule, only the smaller stations are involved and the rates paid for current will be

correspondingly higher. It is interesting, however, to find that the average rate paid by commercial plants was only 1 cent, while the average for municipal plants was 1.6 cents. The West North Central division reported the lowest average rate, seven-tenths of 1 cent, paid by commercial plants, while the highest rate, 1.2 cents, is found in four divisions—New England, East North Central, South Atlantic, and Mountain. Municipal plants secure their purchased current at the lowest rates in the Pacific division (1.1 cents) and the East North Central (1.2 cents). The highest rates are paid in the West North Central division (3.2 cents), the East South Central (2.8 cents), and the New England (2.4 cents).

Taxes.—Some special attention also should be given to the subject of taxes, which have increased very rapidly in amount during the last five years. While they were paid at an average rate of six-tenths of 1 per cent on the cost of plant and equipment in 1912, the rate was 1 per cent in 1917. Municipal plants, of course, are, as a rule, not subject to taxation, though they did expend \$165,856 in 1917 for this purpose. This is due to the fact that in some states municipal lighting plants may, if they are so disposed, pay taxes on their real and personal property, the same as any other corporation, as a result of which they receive in return the usual market rates for services rendered to the municipality. About 70 per cent of all the taxes paid by municipal plants were reported by the East North Central division, and in this division the one state of Ohio returned a total of \$78,654.

Table 81

KIND.	CENTRAL ELECTRIC STATIONS—TAXES, PER CENT DISTRIBUTION.	
	1917	1912
Total.....	100.0	100.0
Real and personal property.....	51.8	61.2
Capital stock.....	4.3	7.6
Federal corporation.....	15.3	4.2
Earnings.....	17.1	19.8
Miscellaneous.....	11.4	7.2

In Table 81 is shown the percentage distribution of the different kinds of taxes paid by commercial plants in 1917 and 1912. It is interesting to find that the relative importance of real and personal property taxes has decreased from 61.2 per cent of the total in 1912 to only 51.8 per cent in 1917. Federal corporation taxes, however, have shown a marked increase, from 4.2 per cent to 15.3 per cent of the total, while miscellaneous taxes have also increased rapidly in importance. The figures returned, however, are frequently open to question because of the fact that some stations misunderstood the requirements regarding the entry of these different items. No doubt some have reported taxes on earnings, under Federal corporation taxes, in the mistaken notion that the latter referred only to state as

opposed to national taxes. In other cases, also, as a result of the wide diversity of new taxes recently imposed, it may be that many payments were incorrectly entered under "miscellaneous" which should have been otherwise reported.

Attention should also be called to the fact that the taxation policy followed by different states with respect to public service corporations varies widely. In Pennsylvania, for instance, there is little taxation of physical property, but comparatively high taxes are imposed on capital stock. In California, on the other hand, both real estate and capital stock taxes for this class of corporations are light, while a heavy tax is imposed on earnings. Other differences might be suggested, but it is sufficiently obvious that no detailed conclusions should be drawn from the aggregate figures as here reported. Suffice it to say that, whatever may be the basis on which taxes are levied, all central electric light and power stations were paying far heavier taxes in 1917 than in 1912, as shown by the fact that at the earlier period such outlays amounted to only 5.5 per cent of the total expenses, while in 1917 taxes formed 7.1 per cent of the total. The further fact, above mentioned, that the rate on the investment in plant and equipment has increased by exactly two-thirds is of even greater significance.

Interest, depreciation, and sinking-fund charges.—Perhaps those expenses which are frequently classified as fixed charges should be briefly considered in this connection. We find that in 1917 commercial stations charged \$26,292,284 to depreciation, paid interest on funded and floating debt amounting to \$71,144,843, and set aside for sinking and other reserve funds \$4,156,942, making a total of \$101,594,069, which is 25.7 per cent of all expenses reported for the year. Municipal plants during the same period expended \$2,014,820 for depreciation, \$2,439,436 for interest, and \$545,422 for the sinking fund, making a total of \$4,999,678, or 15.9 per cent of all expenses.

Upon comparing the relative importance of these outlays at the last two census periods, it appears that in 1912 commercial plants charged to depreciation an amount equal to nine-tenths of 1 per cent of their total investment. They also reported the same rate in 1917, though the proportion which this charge bears to the total expenses dropped from 8.3 per cent to only 6.7 per cent. Municipal plants, on the other hand, apparently expended 1.1 per cent of the total investment for this purpose in 1912 and 1.6 per cent in 1917, while the per cent which this item forms of the total expenses increased from 5.1 to 6.4 per cent.

Sinking and other reserve fund charges were in both cases of very slight importance. They were incurred by commercial plants in 1912 at a rate of two-tenths of 1 per cent on the funded indebtedness and at a rate of three-tenths of 1 per cent in 1917. For municipal plants, on the other hand, the rate was four-tenths of 1 per cent in 1912 and 1 per cent in 1917.

Table 82

CENTRAL ELECTRIC STATIONS—COMPARATIVE DEBT AND AVERAGE INTEREST RATES: 1917 AND 1912.			
	Debt.	Interest paid.	Average rate of interest.
Commercial:			
1917.....	\$1,515,586,568	\$71,144,843	4.7
1912.....	1,045,804,964	46,864,763	4.5
Municipal:			
1917.....	58,638,089	2,439,436	4.2
1912.....	36,493,347	1,438,137	3.9

An interesting comparison can be made between the average rates of interest paid by municipal and commercial stations in 1912 and 1917. At the earlier period commercial stations, with a total indebtedness, including bonds, floating debt, and real estate mortgages, amounting to \$1,045,804,964, paid an average rate of 4.5 per cent interest. At the same period municipal plants, with an outstanding debt of \$36,493,347, paid at the rate of 3.9 per cent. By 1917 the average rate paid by commercial stations had increased to 4.7 per cent on an indebtedness of \$1,515,586,568. Municipal plants, also, report an average rate of 4.2 per cent on a debt of \$58,638,089.

INCOME.

Classified income.—Owing to the increased size of stations and the better utilization of existing equipment as a result of a more satisfactory load factor and diversity factor, the income of all electric stations, both commercial and municipal, has at all periods increased much more rapidly than the number of stations. This is particularly true for commercial stations, which since 1907 have shown a 22 per cent growth in number and an increase of 201.1 per cent in gross income. Municipal stations, on the other hand, have, during the same period, experienced an increase of 85.1 per cent in numbers and of 187.3 per cent in gross income. In other words, the rate of increase in the revenues of commercial plants has been more than nine times as rapid as the growth in number of stations, while for municipal plants it has been little more than twice as rapid.

The figures in Table 83 further show that the rate of increase in income of commercial stations has been relatively less rapid during the last five-year period, 74.4 per cent as compared with a 15.4 per cent growth in number of stations. During the same period, also, municipal plants increased in number by 48.4 per cent, while the income of this group increased 73.4 per cent. As compared with commercial plants, however, the rate of increase in the income from electric service of the municipal plants has been practically equal at all periods. The revenues derived from "all other sources," which include interest and dividends from investments, as well as net profits on sales and on wiring, repairs, etc., form a relatively small proportion of the total, especially in the case of municipal plants. The rate of increase in such

revenues, while more rapid during the period 1907–1912 than the rate of increase in revenues from electric service only—151.1 per cent as opposed to 69.3 per cent for all stations—has been subject to a noticeable retardation during the latest five-year period, when the figures show a 64.1 per cent increase as opposed to an increased revenue from electric service of 74.8 per cent.

Table 83

CLASSIFICATION OF INCOME AND CENSUS YEAR.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME.		
	Total.	Commercial.	Municipal.
Number of stations:			
1917.....	6,542	4,224	2,318
1912.....	5,221	3,659	1,562
1907.....	4,714	3,462	1,252
Gross income:			
1917.....	\$526,894,240	\$486,634,021	\$40,260,219
1912.....	302,273,398	279,054,409	23,218,989
1907.....	175,642,338	161,630,339	14,011,999
Electric service—			
1917.....	502,059,980	462,473,917	39,586,063
1912.....	287,138,657	264,474,949	22,663,708
1907.....	169,614,691	156,000,257	13,614,434
All other sources—			
1917.....	24,834,260	24,160,104	674,156
1912.....	15,134,741	14,579,460	555,281
1907.....	6,027,647	5,630,082	397,565
PER CENT OF INCREASE.			
Number of stations:			
1907–1917.....	38.8	22.0	85.1
1912–1917.....	25.3	15.4	48.4
1907–1912.....	10.8	5.7	24.8
Gross income:			
1907–1917.....	200.0	201.1	187.3
1912–1917.....	74.3	74.4	73.4
1907–1912.....	72.1	72.6	65.7
Electric service—			
1907–1917.....	196.0	196.4	190.8
1912–1917.....	74.8	74.9	74.7
1907–1912.....	69.3	69.5	66.5
All other sources—			
1907–1917.....	312.0	329.1	69.6
1912–1917.....	64.1	65.7	21.4
1907–1912.....	151.1	159.0	39.7

Table 84

ACCOUNT.	CENTRAL ELECTRIC STATIONS—INCOME.				
	Amount.		Per cent of increase.	Per cent of total.	
	1917	1912		1917	1912
Total income.....	\$526,894,240	\$302,273,398	74.3	100.0	100.0
Electric service.....	502,059,980	287,138,657	74.8	95.3	95.0
Commercial light, power, and heat.....	402,262,985	221,200,466	81.8	76.3	73.2
Municipal street lighting.....	36,651,540	27,273,220	84.4	7.0	9.0
Municipal building lighting.....	(¹)	2,504,511	.....	(¹)	0.8
Current sold to other public service corporations.....	57,524,792	31,177,459	84.5	10.9	10.3
Estimated value of free service—					
Commercial stations.....	524,820	513,644	2.2	0.1	0.2
Municipal stations.....	5,095,843	4,466,351	14.0	1.0	1.5
Interest and dividends from investments.....	8,875,597	4,891,449	81.4	1.7	1.6
All other sources.....	15,958,603	10,243,292	55.8	3.0	3.4

¹ Not reported separately in 1917.

It is of some interest to note the rate of increase since 1912 in the revenues derived from the different kinds of service, together with the relative importance of the classified revenues at the two periods. The data presented in Table 84 show that there has been a slight falling off in the proportionate amount of income from "all other sources," from 3.4 per cent in 1912 to only 3 per cent in 1917. The income from commercial light, power, and heat has increased somewhat in relative importance, from 73.2 per cent of the total in 1912 to 76.3 per cent in 1917. There

has been little change relatively in the revenues received from the sale of current to other public service corporations, but municipal street lighting has experienced a decrease from 9 per cent at the earlier period to only 7 per cent in 1917. The less rapid rate of increase in revenues derived from street lighting will continue from year to year, as most municipalities in which electric service is available have already installed street-lighting systems to the needed extent. The estimated value of free service has in the case of commercial stations remained almost stationary, while the increase has been very slight, only 14 per cent, for municipal stations. These figures indicate that municipal plants are generally adopting the policy of charging for the services which formerly they rendered gratis to the municipalities in which they are located.

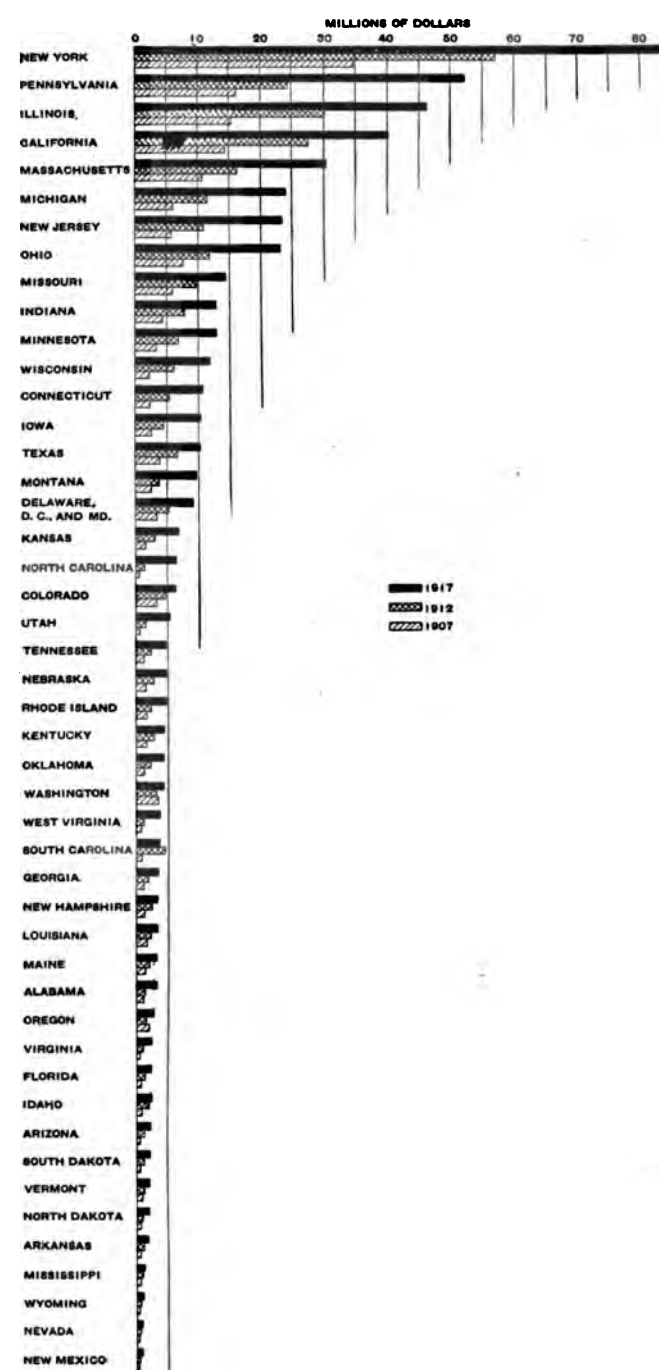
At the preceding census no attempt was made to secure a separate statement of the revenues derived from the sale of current for light and for power. The schedules for 1917, however, call for such a segregation whenever practicable. Further, the income derived from the sale of current for lighting public buildings was at this date combined with the general revenues from commercial lighting. In a number of cases, owing to the way in which accounts are kept, it was impossible to separate light and power revenues. In such instances, however, it nearly always happens that the current so used was metered separately, and, accordingly, it was possible to secure reasonably accurate estimates of the income from the two sources, so that the figures can be regarded as approximately correct. In Table 85 is shown the amount as well as the percentage distribution of income from the sale of current, together with the estimated value of free service, which is in almost every instance lighting service.

Table 85

CHARACTER OF SERVICE.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—INCOME: 1917.					
	Total.	Commercial.	Municipal.	Per cent distribution.		
				Com- mer- cial.	Mu- nici- pal.	
Total.....	\$502,059,980	\$462,473,917	\$39,586,063	100.0	100.0	
Commercial lighting.....	241,062,303	218,448,126	22,614,177	47.2	57.1	
Street lighting.....	36,651,540	31,461,959	5,189,581	6.8	13.1	
Power.....	161,200,682	154,831,546	6,369,136	33.5	16.1	
Other public service corporations.....	57,524,792	57,207,466	317,326	12.4	0.8	
Estimated value of free service.....	5,620,663	524,820	5,095,843	0.1	12.9	

It appears from Table 85 that the income from paid street lighting is relatively twice as important in the municipal station income as in that of commercial stations (13.1 per cent as opposed to 6.8 per cent). In this connection, however, it should be noted that while the estimated value of free service is only one-tenth of 1 per cent of the total income in the case of the latter, it amounts to 12.9 per cent in the case of the former. Therefore, since practically all of this

DIAGRAM 15.—GROSS INCOME, BY STATES: 1917, 1912, AND 1907.



free service is for street lighting, the two items should be considered together, and the resultant figure is 26 per cent of the total income of municipal plants that is derived from street lighting. This amount, added to the commercial lighting income, 57.1 per cent, makes the entire income secured from different kinds of electric light 83.1 per cent of the total municipal plant revenues from the sale of current. The corresponding percentage for commercial stations is only 54.2 per cent. Other things being equal, municipal plants might be expected to charge somewhat lower rates per kilowatt hour for lighting service than commercial plants, in view of the fact that so large a proportion of their business is street light-

ing, which is normally furnished at a much lower unit cost than commercial and domestic lighting, partly because of the long hours of service. Commercial stations receive 33.5 per cent of their electric service income from the sale of current for power, a proportion more than twice as great as that of municipal plants. They report 12.4 per cent from the sale of current to other public service corporations as opposed to only eight-tenths of 1 per cent for municipal stations.

In view of the attention which has already been called to those states which lead in electric development, little need be said regarding the income statistics, classified according to states and geographic divisions. The gross income of commercial plants, however, is by far the highest in the Middle Atlantic division (\$157,994,253) and the East North Central (\$105,518,688). The New England division ranks next, with a gross income of only \$51,377,071. The leading states are New York (\$83,675,233), Pennsylvania (\$51,160,607), Illinois (\$42,417,210), California (\$38,711,868), Massachusetts (\$28,334,813), New Jersey (\$23,158,413), Michigan (\$21,787,591), and Ohio (\$19,875,339). No other states approach these in the amount of income reported. For municipal stations the highest revenues are reported by the East North Central (\$10,989,300) and the West North Central divisions (\$7,658,024). The nearest rivals report little more than half the smaller amount.

To the figures for these two divisions should also be added an estimated value of free service amounting, respectively, to \$1,642,317 and \$945,120. The states returning the highest revenues from municipal stations are Illinois, Ohio, Indiana, Michigan, Washington, Massachusetts, and Kansas, all of which, including free service, report an income in excess of \$2,000,000. It is further noticeable that in many states in which municipal lighting plants are of importance little free service is rendered by them. This applies particularly to California, Wisconsin, and Washington.

Income of stations, classified according to dynamo capacity.—As at previous censuses, data have been assembled to show the income of stations grouped according to their dynamo capacity as well as of stations having no generating equipment. Accordingly, in Table 86 the relative importance of the different groups is clearly shown. It appears that during the last 10 years there has been little increase in the income from electric service reported by stations having a dynamo capacity of less than 200 kilowatts. The rate of increase for this service during the decade in the next four groups, ranging from a capacity of 200 kilowatts to less than 5,000 kilowatts, has in no case been marked, the lowest being 47.1 per cent and the highest only 71.5 per cent. In the two lower groups, also, there has been an actual decrease for the period in revenues derived from "all other sources."

Table 86

CENTRAL ELECTRIC STATIONS—GROSS INCOME FOR STATIONS GROUPED ACCORDING TO DYNAMO CAPACITY: 1917, 1912, AND 1907.

CLASS OF INCOME AND CENSUS YEAR.	Total.	Stations grouped according to dynamo capacity.						Stations having no generating equipment.
		Under 200 kilowatts.	200 and under 500 kilowatts.	500 and under 1,000 kilowatts.	1,000 and under 2,000 kilowatts.	2,000 and under 5,000 kilowatts.	5,000 kilowatts and over.	
Number of stations:								
1917.....	6,542	3,348	899	335	242	182	237	1,299
1912.....	5,221	2,902	948	337	214	152	161	507
1907.....	4,714	3,038	821	269	169	115	75	227
Per cent of increase: 1907-1917.....	38.8	10.2	9.5	24.5	43.2	58.3	.....	472.2
Gross income:								
1917.....	\$526,894,240	\$18,197,458	\$21,269,811	\$18,019,711	\$22,316,555	\$34,374,216	\$386,849,516	\$25,866,973
1912.....	302,273,398	16,625,878	18,111,238	14,079,923	16,518,054	25,448,529	188,592,142	22,897,634
1907.....	176,642,338	17,140,070	14,786,719	10,465,110	13,146,808	21,915,199	89,930,073	8,255,359
Per cent of increase: 1907-1917.....	200.0	6.2	43.8	72.2	69.7	56.9	330.2	213.3
Electric service—								
1917.....	\$502,059,980	\$17,699,918	\$20,531,425	\$17,283,248	\$21,511,270	\$32,769,636	\$367,104,799	\$25,159,684
1912.....	287,138,657	15,934,092	17,166,227	13,322,200	15,832,795	24,398,710	179,265,042	21,219,591
1907.....	169,614,691	16,344,745	13,964,068	10,075,476	12,617,855	21,277,402	87,277,832	8,067,293
Per cent of increase: 1907-1917.....	196.0	8.3	47.1	71.5	70.5	54.0	320.6	211.9
All other sources:								
1917.....	\$24,834,260	\$497,540	\$738,386	\$736,463	\$805,285	\$1,604,580	\$19,744,717	\$707,289
1912.....	15,134,741	691,786	945,011	757,723	685,259	1,049,819	9,327,100	1,678,043
1907.....	6,027,647	795,325	832,631	389,634	531,953	637,797	2,652,241	188,066
Per cent of increase: 1907-1917.....	312.0	-37.4	-11.3	89.0	51.4	151.6	644.5	276.1

¹ A minus sign (—) denotes decrease. Percentages are omitted when base is less than 100.

The group of stations having a dynamo capacity in excess of 5,000 kilowatts reported an extraordinarily high percentage increase for the decade in gross income, 330.2 per cent, and the rate of increase for each five-year period was more than 100 per cent. In 1917 these stations, which comprised only 4.5 per cent of all stations supplied with generating equipment, reported 77.2 per cent of the entire income received by such stations. It is further significant that since 1907 there has been a very rapid growth, 213.3 per cent, in the gross income of stations having no gener-

ating equipment, though there has not been much change since 1912, due to the aforementioned fact that three large plants, at the earlier date purchasing all their current, now have some generating equipment. Finally, it is significant that, while the number of smaller generating stations has shown little change during the decade and while in two instances there has been an actual decrease during the past five years, the number in the highest group has increased 216 per cent and the number of stations without generating equipment has increased 472.2 per cent.

Average rates per kilowatt hour.—It may be of some interest to discuss briefly the average rates per kilowatt hour charged for the various services. Accordingly, Table 87 has been prepared to show, by geographic divisions and states, the general conditions which exist. Though in some cases the figures are open to question, owing to the fact that the output and disposal of current are frequently estimated and not measured by the smaller stations, yet it is thought that the figures are sufficiently dependable to be here presented.

Table 87

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE RATE PER KILOWATT HOUR: 1917 (CENTS).

DIVISION AND STATE.	Total.			Commercial.			Municipal.		
	Light.	Power.	Sold to other companies.	Light.	Power.	Sold to other companies.	Light.	Power.	Sold to other companies.
UNITED STATES.....	5.5	1.2	0.7	5.6	1.2	0.7	4.9	1.8	1.5
GEOGRAPHIC DIVISIONS:									
New England.....	6.9	1.7	0.9	6.9	1.7	0.9	6.8	2.1	2.0
Middle Atlantic.....	5.8	0.9	0.8	5.6	1.0	0.8	5.8	2.6	2.7
East North Central.....	4.4	1.6	0.7	5.2	1.6	0.7	3.7	1.7	1.6
West North Central.....	5.9	1.4	0.6	5.6	1.4	0.6	7.6	2.3	4.0
South Atlantic.....	5.4	1.0	0.7	5.0	0.9	0.7	6.7	2.0	0.5
East South Central.....	5.5	1.4	0.8	5.2	1.3	0.8	6.7	2.1	1.0
West South Central.....	6.4	2.1	1.1	6.2	2.1	1.0	7.8	2.6	1.9
Mountain.....	6.5	0.8	0.5	6.6	0.8	0.5	5.5	2.0	2.0
Pacific.....	4.5	1.2	0.7	5.0	1.2	0.7	2.7	1.1	0.4
NEW ENGLAND.....	6.9	1.7	0.9	6.9	1.7	0.9	6.8	2.1	2.0
Maine.....	6.5	0.8	0.9	6.7	0.8	0.9	5.1	3.5	.....
New Hampshire.....	5.0	1.9	0.8	7.9	1.8	0.8	10.5	6.5	.....
Vermont.....	7.4	1.7	1.0	8.3	1.7	1.0	5.1	1.5	1.7
Massachusetts.....	7.2	1.8	0.9	7.2	1.8	0.9	7.1	2.0	2.3
Rhode Island.....	5.8	1.4	1.0	5.8	1.4	1.0	13.1	.....	.....
Connecticut.....	6.3	2.2	1.1	6.3	2.2	1.1	6.8	2.8	.....
MIDDLE ATLANTIC.....	5.6	0.9	0.8	5.6	1.0	0.8	5.8	2.6	2.7
New York.....	5.3	0.7	0.7	5.3	0.7	0.7	5.8	2.3	4.0
New Jersey.....	8.5	2.1	0.9	8.5	2.1	0.9	7.6	3.0	.....
Pennsylvania.....	5.3	1.1	1.0	5.3	1.0	1.0	5.5	3.1	2.7
EAST NORTH CENTRAL.....	4.9	1.6	0.7	5.2	1.6	0.7	3.7	1.7	1.6
Ohio.....	3.8	1.6	0.7	3.8	1.6	0.7	3.8	1.6	1.6
Indiana.....	6.4	1.8	1.2	6.8	1.8	1.2	5.5	2.2	1.7
Illinois.....	4.6	2.0	0.7	5.2	2.0	0.7	2.4	1.4	4.0
Michigan.....	5.7	1.3	0.8	6.0	1.3	0.8	4.3	1.8	1.7
Wisconsin.....	5.9	1.6	0.6	5.6	1.5	0.6	4.4	3.1	1.4
WEST NORTH CENTRAL.....	5.9	1.4	0.6	5.6	1.4	0.6	7.6	2.3	4.0
Minnesota.....	4.6	1.1	0.5	4.2	1.1	0.5	7.3	4.1	4.3
Iowa.....	7.6	1.3	0.5	7.4	1.2	0.5	8.7	3.4	4.7
Missouri.....	5.3	1.7	0.7	5.0	1.7	0.7	8.3	1.8	2.2
North Dakota.....	10.0	4.4	2.3	10.0	4.3	2.3	9.7	5.4	.....
South Dakota.....	10.3	3.0	1.6	9.9	3.0	1.4	12.0	3.2	6.7
Nebraska.....	6.8	2.1	1.8	6.5	2.1	1.7	7.7	2.1	6.4
Kansas.....	6.2	1.5	1.4	6.2	1.5	1.3	6.1	1.6	5.0
SOUTH ATLANTIC.....	5.4	1.0	0.7	5.0	0.9	0.7	6.7	2.0	5.9
Delaware, District of Columbia, and Maryland.....	5.1	1.0	0.5	5.1	1.0	0.5	5.8	1.6	8.7
Virginia.....	5.5	1.4	0.8	6.1	1.3	0.8	4.4	2.2	.....
West Virginia.....	3.1	1.3	0.9	3.0	1.3	0.9	6.9	3.4	.....
North Carolina and South Carolina.....	6.1	0.8	0.7	5.9	0.8	0.7	6.4	1.6	5.0
Georgia.....	7.4	1.8	0.9	5.4	1.0	0.9	8.2	2.0	5.6
Florida.....	7.9	2.5	1.7	8.6	2.4	1.7	7.1	2.7	.....
EAST SOUTH CENTRAL.....	5.5	1.4	0.4	5.2	1.3	0.3	6.7	2.1	1.0
Kentucky.....	5.9	2.0	0.9	6.0	2.0	0.9	5.0	1.6	1.0
Tennessee.....	4.6	2.4	0.3	4.4	2.4	0.3	5.4	2.7	.....
Alabama.....	4.5	0.8	0.6	3.7	0.7	0.6	9.5	3.2	.....
Mississippi.....	8.0	2.1	1.3	7.8	2.3	1.3	8.3	1.7	.....
WEST SOUTH CENTRAL.....	6.4	2.1	1.1	6.4	2.1	1.1	7.8	2.6	1.9
Arkansas.....	7.2	2.8	1.2	7.1	2.7	1.2	7.6	3.6	.....
Louisiana.....	4.8	2.3	1.1	4.4	2.1	1.0	7.6	4.8	2.1
Oklahoma.....	7.6	1.8	1.3	7.0	1.8	1.2	9.8	1.7	4.5
Texas.....	6.6	2.2	1.0	6.7	2.2	1.0	6.1	2.4	0.8
MOUNTAIN.....	6.5	0.8	0.5	6.6	0.8	0.5	5.5	2.0	2.0
Montana.....	7.4	0.6	0.3	7.3	0.6	0.3	9.1	2.9	.....
Idaho.....	6.2	0.8	1.0	6.5	0.8	1.0	4.0	1.0	.....
Wyoming.....	6.3	2.1	2.1	6.1	2.0	2.1	10.4	30.9	.....
Colorado.....	5.8	1.6	0.6	5.8	1.6	0.6	7.2	3.5	3.6
New Mexico.....	10.8	3.2	2.3	10.7	3.4	2.3	11.7	1.0	.....
Arizona.....	9.7	1.9	2.1	9.7	1.9	2.1	10.6	5.0	2.3
Utah.....	5.5	0.7	0.8	5.8	0.7	0.8	3.4	0.9	1.2
Nevada.....	6.5	1.0	0.5	6.5	1.0	0.5	6.5	3.1	.....
PACIFIC.....	4.5	1.2	0.7	5.0	1.2	0.7	2.7	1.1	0.4
Washington.....	4.6	0.9	0.8	6.4	0.9	1.3	3.8	0.9	0.4
Oregon.....	5.9	1.4	1.1	6.2	1.4	1.1	4.4	1.3	.....
California.....	4.3	1.2	0.7	4.8	1.2	0.7	1.9	1.7	1.1

It appears from Table 87 that for all plants in the United States the average lighting rate is 5.5 cents, the average power rate 1.2 cents, and the average charge for current supplied to other public service corporations seven-tenths of 1 cent. The average rates for all commercial plants vary from the United States total only in one particular, the average lighting rate being 5.6 cents instead of 5.5 cents. For this group of stations the highest lighting rates are found in New Mexico (10.7 cents), North Dakota (10 cents), South Dakota (9.9 cents), and Arizona (9.7 cents). The lowest lighting rates are reported by West Virginia (3 cents), Alabama (3.7 cents), Ohio (3.8 cents), Minnesota (4.2 cents), Louisiana (4.4 cents), Tennessee (4.4 cents), and California (4.8 cents). The New England division reports the highest lighting rate, 6.9 cents, while the South Atlantic and the Pacific return the lowest, 5 cents. In individual instances much higher rates than those mentioned are found—as high as 25 cents in some small plants.

The lowest average rate for power is met with in the Mountain division (eight-tenths of 1 cent) and South Atlantic (nine-tenths of 1 cent), while the highest average rates are found in the West South Central (2.1 cents), New England (1.7 cents), and East North Central (1.6 cents). The individual states which report high power rates are, in general, the same as those which have high lighting rates, North Dakota leading with 4.3 cents, followed by New Mexico (3.4 cents) and South Dakota (3 cents). Commercial plants in several states, however, report an average power rate under 1 cent. These states are Montana (six-tenths of 1 cent), Alabama (seven-tenths of 1 cent), Utah (seven-tenths of 1 cent), New York (seven-tenths of 1 cent), North and South Carolina (eight-tenths of 1 cent), Maine (eight-tenths of 1 cent), Idaho (eight-tenths of 1 cent), and Washington (nine-tenths of 1 cent). All divisions except the West South Central appear to supply current to other companies for a rate of less than 1 cent per kilowatt hour. Commercial plants in the West South Central division charge an average rate of 1 cent, while in the East South Central the lowest rate, three-tenths of 1 cent, occurs. Several states—Delaware, Maryland, Tennessee, Montana, Minnesota, Iowa, and Nevada—report a rate of five-tenths of 1 cent or less.

The averages for municipal plants show some wide variations from the general average for the United States, and on account of the condition of many of the schedules received are less dependable than the corresponding rates of commercial plants. The lighting rate, which is based on the total income from sale of current plus the estimated value of free service, as reported by the plants is 4.9 cents as opposed to 5.6 cents for commercial stations. This slightly lower rate can readily be accounted for by the fact that so large a portion of the business of the average publicly owned plant consists in furnishing street lighting. Further, on account of the small areas served, heavy investment in distribution lines is not incurred, nor

in many cases are the current losses in distribution so great as is met with in commercial stations. Finally, it appears from the schedules that municipal plants are disposed to underestimate the amount of current lost in distribution for two reasons: First, because their current is not, as a rule, so carefully metered either at the station or on the consumers' premises, and, secondly, because the large percentage of current which is supplied for street lighting can not be measured at the lamp terminals. When the municipality is financing the operation of the plant, it is sometimes considered unnecessary to watch these matters so closely as must be done in commercial stations. Hence it no doubt frequently happens that a considerable quantity of current which is actually lost in distribution is reported as "sold" by municipal plants. Thus the average lighting rate would appear lower than it really is because of the fact that there will be a relatively larger divisor for a given amount of income.

The West South Central division and the West North Central division report the highest average lighting rate for municipal plants, 7.8 cents and 7.6 cents, respectively. The states of Rhode Island, South Dakota, New Mexico, Arizona, New Hampshire, and Wyoming all report an average lighting rate in excess of 10 cents. The lowest lighting rate for municipal plants is found in California (1.9 cents), Illinois (2.4 cents), Utah (3.4 cents), Ohio (3.8 cents), and Washington (3.8 cents). These low rates are, in general, explained by local conditions. In California the number of stations is comparatively few, and one or two large plants which utilized hydroelectric power largely influenced the state average. In Illinois the extremely large Chicago municipal plants, which confine their activities solely to municipal lighting and the supply of power for municipal uses, but which do no general commercial business and which are consequently operated at a very low cost, seriously affect the state average. In Washington water power is widely used, and the plant in Seattle causes the state average to be out of line with what might be considered the normal figure. In Ohio, also, the large street-lighting plant of Columbus reports a very low estimated value of free service, and the Cleveland plant, operating in a compact and limited area, also reports unusually low rates.

The average power rate charged by municipal stations, 1.8 cents, is 50 per cent higher than the average reported by commercial plants, while the rate for current sold to other companies, 1.5 cents, is more than twice as high as that in the other group. The lowest power rates are reported by plants in the states of Washington (nine-tenths of 1 cent), Utah (nine-tenths of 1 cent), New Mexico (1 cent), and Idaho (1 cent). The highest rates, on the other hand, occur in Wyoming (30.9 cents), New Hampshire (6.5 cents), North Dakota (5.4 cents), Arizona (5 cents), and Louisiana (4.8 cents). The extraordinarily high Wyoming figure results from one of the few

schedules in the state which reports unusual conditions. Three states—Washington, Texas, and Kentucky—report a rate of 1 cent or less per kilowatt hour for current supplied to other companies, while the maximum figures range as high as 8.6 cents. There are also 19 states in which municipal plants report no sales of current to other companies.

Net income and financial results of operation.—From the computation for the total expenses which have been made, it appears that commercial stations received a net income of \$91,506,626 during the year 1917, which is equivalent to 3.1 per cent on the reported value of plant and equipment. Out of this sum dividends were paid amounting to \$64,589,321, leaving a balance of \$26,917,305 to be carried to surplus or otherwise disposed of.

Municipal plants in 1917 report a net income, after the estimated value of free service has been included, of \$8,819,307, which is equivalent to 6.9 per cent of the value of plant and equipment. Though this relatively high showing on the basis of the investment value is due in large measure to the low investment accounts returned by municipal plants, yet attention should be called in this connection to the fact that municipal plants do not incur a number of important expenses which must be met by commercial stations. In the first place, they are practically free from taxation, whereas the former pay nearly \$30,000,000 under this head. Secondly, they have no salaried officers of corporations, while commercial plants pay more than \$5,000,000 for such salaries. If an allowance were made for these two items alone, for comparative purposes it would be necessary to deduct \$35,000,000 from the reported expenses of commercial stations, an operation which would increase the net income by an equal amount, so that the rate would be equivalent to 4.3 per cent on the value of plant and equipment instead of 3.1 per cent. Numerous smaller charges also are frequently escaped by municipal plants. The smaller ones customarily occupy office space in public buildings and thus save on rent. They also frequently pay no insurance and receive services of different kinds from other municipal departments without incurring any financial obligation. In those cases in which bonds have been paid off by means of appropriations from the tax levy they are relieved of a large amount of interest payments; and it should be recalled that in 1917, 18 per cent of the entire expenses of commercial plants were interest payments, while the expenses for municipal plants amounted to only 7.8 per cent of the total.

A large number of plants in both groups were operated at a loss in 1917. The total number was 1,164, of which 761 were commercial and 403 municipal. In other words, 18 per cent of all commercial stations and 17.4 per cent of municipal stations, after the estimated value of free service had been allowed for, were operated at a deficit during the year.

CHAPTER IX.—EMPLOYEES, SALARIES, AND WAGES.

Character of the statistics.—As in 1912, an effort was made in 1917 to secure the representative number of classified employees in the service of the various central stations during the month of September. The date arbitrarily chosen was September 29 in 1917 and September 16 in 1912. At the first two censuses, in 1902 and 1907, the average number of employees was called for. Since, however, it proved to be extremely difficult for many plants to return a true average, this method of calling for the data was for practical reasons given up. Owing, therefore, to the change in method of collecting these statistics, the 1907 figures are not wholly satisfactory for purposes of comparison with the two later dates, though they may be regarded as approximately correct.

It should further be stated that the schedules call only for those employees who are *regularly* in the service of the different stations. Accordingly, those who are engaged primarily in making extensions and in new construction work are presumably excluded from the census returns, as their services are properly chargeable to the capital account. It must, however, be admitted that in many cases it is practically impossible for stations to make the required separation, and as a result the data will not always be accurate. Further, particularly in the case of composite stations, it is sometimes an extremely difficult matter to segregate properly the employees engaged in one part of the business from those engaged in the electric plants. In such cases all that can be secured are reasonable estimates. Finally, in many small plants, particularly those operating under municipal ownership, there are a number of part-time employees whose yearly compensation ap-

pears to be abnormally low. In such cases, when the condition was perfectly evident on the schedules, those employees who apparently devoted a small portion of their time to the service of the electric plant were eliminated in preparing the general tabulations and their wages charged to "all other" expenses. Thus more nearly accurate wage rates could be secured. As the data are presented in 1917 it is probable that the wage statistics are more nearly correct than at any preceding period, and it is also probable that more satisfactory comparisons can be made between the rates paid by commercial and municipal stations.

Comparative statistics of employees, salaries, and wages.—In Table 88 is shown for all stations, as well as for commercial and municipal plants separately, the total number of the various classes of employees, together with the amount of compensation paid to each class, as well as the per cent of increase in the various items since 1907. Commercial plants at this date reported almost 90 per cent, or 94,679 out of a total of 105,541 of all employees, and paid about 91 per cent of all salaries and wages. At this date, also, 65.6 per cent of all commercial-station employees are classified as "wage earners," that is, those who are engaged in a subordinate capacity doing other than office work; 27.8 per cent were clerks, stenographers, etc.; 4.2 per cent superintendents and managers; while the salaried officers constituted only 2.5 per cent of the total. These officers, however, received 5.9 per cent of all salaries and wages paid, while superintendents and managers received 8.4 per cent, and clerks and wage earners 25.5 per cent and 60.2 per cent, respectively.

Table 88

COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—EMPLOYEES, SALARIES, AND WAGES: 1917, 1912, AND 1907.

CLASS.	Total.			Commercial.			Municipal.			Per cent of increase: 1907-1917.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907	Total.	Com- mer- cial.	Mu- nici- pal.
Total:												
Number.....	105,541	79,335	47,632	94,679	71,395	42,066	10,862	7,940	5,566	121.6	125.1	95.1
Salaries and wages.....	\$96,241,858	\$61,161,941	\$35,420,324	\$86,473,496	\$55,658,515	\$31,935,309	\$8,768,362	\$5,503,426	\$3,485,015	168.9	170.8	151.6
Salaried employees:												
Officers of corporations—												
Number.....	2,323	2,181	1,761	2,323	2,181	1,761				31.9	31.9	.....
Salaries.....	\$5,136,068	\$3,839,136	\$2,202,028	\$5,136,068	\$3,839,136	\$2,202,028				133.2	133.2	.....
Superintendents and managers—												
Number.....	5,218	4,792	4,357	3,951	3,629	3,268	1,267	1,163	1,069	19.8	20.9	16.8
Salaries.....	\$8,670,814	\$6,482,749	\$5,058,236	\$7,287,596	\$5,397,004	\$4,243,307	\$1,383,218	\$1,085,745	\$814,929	71.4	71.7	69.7
Clerks, stenographers, and other salaried employees—												
Number.....	27,865	19,120	6,872	26,318	18,067	6,346	1,547	1,053	526	305.5	314.7	194.1
Salaries.....	\$22,980,829	\$13,985,419	\$4,473,523	\$22,015,212	\$13,400,937	\$4,293,620	\$965,617	\$584,482	\$179,903	413.7	412.7	436.7
Wage earners:												
Number.....	170,135	53,242	34,642	162,067	47,518	30,691	18,048	5,724	3,951	102.4	102.3	103.7
Wages.....	\$58,454,157	\$36,854,637	\$23,686,537	\$52,034,630	\$33,021,438	\$21,196,354	\$6,419,527	\$3,833,199	\$2,490,183	146.8	145.5	157.8

¹ Number Sept. 29, 1917, or nearest representative day.

² Number Sept. 16, 1912, or nearest representative day.

³ Average number.

Municipal stations, of course, report no salaried officers of corporations. Their total number of so-called salaried employees is 2,814, or 25.9 per cent of all their employees, as compared with 32,592, or 34.4 per cent of the total for commercial stations. They also receive 26.8 per cent of the salaries and wages paid. Hence it is apparent that there is little difference between the average rates of compensation paid to salaried employees and wage earners of municipal stations.

It is interesting to find that in every case salaries and wages have increased much more rapidly in both commercial and municipal stations than has the number of employees. The most rapid increase, both in number of employees and in amount of salaries paid, is found to have taken place in the group of clerks, stenographers, and other salaried employees; the lowest rate of increase, both in number and in total compensation, is found in the case of superintendents and managers, while the most rapid rate of increase in salaries paid relative to the increase in the number receiving such salaries is shown for officers of corporations.

Table 89 gives a comparative statement of the average compensation received by the different classes of employees in commercial and municipal stations at the last three census periods. Several significant relations are evident. First, the average compensation of all employees in commercial stations, \$913, is considerably higher than the corresponding average for municipal stations, which report only \$807. Upon examining the different classes of employees, however, it appears that the widest variations between the two groups exist in the salaries which are paid to superintendents and managers. The average for commercial stations is \$1,844 and for municipal plants only \$1,092. This condition is partially, though not wholly, due to the fact that municipal plants in general are much smaller than the other group, and hence do not require as highly trained and able managers. Another noticeable difference exists in the compensation paid to office help, the average for commercial stations being \$837, while the average for municipal plants is only \$624. The average wages paid, however, are not far apart in either case, being \$838 for the former and \$798 for the latter.

Table 89

CLASS.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE SALARIES AND WAGES: 1917, 1912, AND 1907.								
	Total.			Commercial.			Municipal.		
	1917	1912	1907	1917	1912	1907	1917	1912	1907
All employees.....	\$902	\$771	\$744	\$913	\$780	\$759	\$807	\$693	\$626
Salaried employees—									
Officers of corporations.....	2,211	1,760	1,250	2,211	1,760	1,250	.....	.....	.....
Superintendents and managers.....	1,662	1,353	1,161	1,844	1,487	1,298	1,092	934	748
Clerks, stenographers, and other salaried employees.....	825	731	651	837	742	677	624	555	342
Wage earners.....	833	692	684	838	695	691	798	670	630

Some reference should also be made in this connection to the relative rate of increase in average compensation paid during the last five years, when wages and salaries have been advancing rapidly. It appears, accordingly, that the salaries of officers of corporations increased 25.6 per cent since 1912 and during the preceding five-year period the increase was 40.8 per cent. During the last five-year period, also, the salaries of superintendents and managers show an increase for commercial stations of 24 per cent. During the same period wage earners secured an advance of 20.6 per cent, while clerks, stenographers, and other office employees stand lowest in the list, with an advance of only 12.8 per cent. In municipal plants, also, relatively similar conditions are to be found. Here, however, wage earners head the list in the rate of increase in compensation, with an advance of 19.1 per cent since 1912. Superintendents and managers received an advance of 16.9 per cent, while the clerical force again lags behind with an advance of only 12.4 per cent. These figures furnish further evidence of the fact that it is the salaried employee with modest compensation who finds it most difficult to secure wage increases commensurate with the increased cost of living. The rapid rate of increase in average compensation of the office force in municipal plants from \$342 in 1907 to \$555 in 1912 is difficult to explain, but is doubtless accounted for largely by certain inaccuracies in the returns for the earlier period.

In Table 90 is given the amount of salaries and wages paid, by geographic divisions and by states, together with the rate of increase for the decade and for the five-year periods since 1907.

As is to be expected, the largest amount was expended in salaries and wages by the states of New York, Pennsylvania, Illinois, and California, which also report the highest proportion of wage earners. That situation in this regard has been the same at the last three census periods. During the last five years the rate of increase in the number of employees has been most rapid in Utah, 203 per cent; North Carolina, 103.3 per cent; and Arizona, 100.9 per cent. During the same period the rate of increase in the total amount paid for salaries and wages has been most marked in Virginia, 165.3 per cent; West Virginia, 164.2 per cent; Utah, 156.7 per cent; North Carolina, 142 per cent; Alabama, 109.8 per cent; Arizona, 105.3 per cent; and Wisconsin, 101.8 per cent. In nearly every state at all periods the rate of increase in total compensation has been more rapid than the rate of increase in the number of employees. For the period 1912-1917, however, six states—Rhode Island, Missouri, North Dakota, Mississippi, Idaho, and Utah—report a percentage growth in number of wage earners in excess of the increase in amount of wages paid.

Table 91 makes possible a more detailed study of conditions as they were found in 1917. In this table the classified employees, together with their compensation, are recorded according to geographic divisions

and states. Here again it is found that in practically every instance the states of New York, Pennsylvania, Illinois, and California lead the list. In the number of clerks and stenographers, however, Massachusetts

stands third, ranking ahead of Pennsylvania and California, but in the total compensation paid to this group of employees, that state ranks fourth. Further comments on the table are unnecessary.

CENTRAL ELECTRIC STATIONS—TOTAL NUMBER OF EMPLOYEES AND SALARIES AND WAGES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

Table 90 DIVISION AND STATE.	1917		1912		1907		PER CENT OF INCREASE. ¹					
	Num- ber.	Salaries and wages.	Num- ber.	Salaries and wages.	Num- ber.	Salaries and wages.	1907-1917		1912-1917		1907-1912	
							Num- ber.	Salaries and wages.	Num- ber.	Salaries and wages.	Num- ber.	Salaries and wages.
UNITED STATES.....	105,541	\$95,241,858	79,335	\$61,161,941	47,632	\$35,420,324	121.6	168.9	33.0	55.7	66.6	72.7
GEOGRAPHIC DIVISIONS:												
New England.....	10,157	8,763,855	7,352	5,604,983	5,088	3,899,439	99.6	124.7	38.2	56.4	44.5	43.7
Middle Atlantic.....	32,048	29,735,092	24,022	18,612,382	13,977	10,431,544	129.3	185.0	33.4	59.8	71.9	78.4
East North Central.....	24,361	22,850,710	19,233	14,085,033	10,324	7,213,771	136.0	216.8	26.7	62.2	86.3	95.3
West North Central.....	12,231	9,612,183	7,892	5,875,467	5,007	3,538,044	144.3	171.7	55.0	63.6	57.6	66.1
South Atlantic.....	5,948	4,619,838	4,317	2,780,706	2,622	1,692,982	126.8	172.9	37.8	66.1	64.6	64.2
East South Central.....	3,296	2,412,130	2,426	1,641,770	1,632	919,524	102.0	162.3	35.9	46.9	48.7	78.5
West South Central.....	4,757	3,723,235	3,655	2,543,847	2,474	1,594,619	92.3	133.5	30.2	46.4	47.7	59.5
Mountain.....	4,828	4,716,199	3,090	2,927,122	2,028	1,819,343	138.1	159.2	56.2	61.1	52.4	60.9
Pacific.....	7,915	8,808,616	7,348	7,090,631	4,480	4,311,058	76.7	104.3	7.7	24.2	64.0	64.5
NEW ENGLAND:												
Maine.....	772	619,739	629	402,394	502	308,006	53.8	101.2	22.7	54.0	25.3	30.6
New Hampshire.....	732	603,027	578	434,617	422	286,749	73.4	110.3	26.6	38.7	37.0	51.6
Vermont.....	443	350,735	340	219,897	297	188,780	49.2	85.8	30.3	59.5	14.5	16.5
Massachusetts.....	5,482	4,557,883	3,954	2,981,043	2,672	2,235,647	105.2	103.9	38.6	52.9	48.0	33.3
Rhode Island.....	790	780,323	511	512,771	450	350,605	75.6	116.9	54.6	48.3	13.6	46.3
Connecticut.....	1,938	1,872,148	1,340	1,064,261	745	529,652	160.1	253.5	44.6	77.6	79.9	99.0
MIDDLE ATLANTIC:												
New York.....	16,248	15,314,748	13,733	11,034,898	7,716	5,819,617	110.6	163.2	18.3	38.8	78.0	89.6
New Jersey.....	5,065	4,821,852	2,989	2,479,219	1,759	1,370,506	187.9	251.8	69.4	94.5	69.9	80.9
Pennsylvania.....	10,735	9,598,492	7,300	5,098,265	4,502	3,241,421	138.4	196.1	47.0	88.3	62.2	57.3
EAST NORTH CENTRAL:												
Ohio.....	4,714	4,143,688	3,131	2,264,892	2,157	1,543,925	118.5	168.4	50.6	83.0	45.2	46.7
Indiana.....	2,897	2,371,606	2,269	1,525,875	1,618	969,263	79.0	144.7	27.7	55.4	40.2	57.4
Illinois.....	9,294	8,636,523	8,036	6,223,882	3,902	3,032,721	138.2	184.8	15.6	38.8	105.9	105.2
Michigan.....	4,738	5,223,067	3,876	2,843,371	1,780	1,126,813	166.2	363.5	22.2	83.7	117.8	152.3
Wisconsin.....	2,718	2,475,826	1,921	1,227,013	867	541,049	213.5	357.6	41.5	101.8	121.6	126.8
WEST NORTH CENTRAL:												
Minnesota.....	2,520	2,011,137	1,568	1,222,493	1,062	755,778	137.3	166.1	60.7	64.5	47.6	61.8
Iowa.....	2,083	1,679,790	1,329	921,096	855	547,177	143.6	207.0	56.7	82.4	55.4	68.3
Missouri.....	3,767	2,776,597	2,434	1,883,844	1,800	1,306,640	109.3	112.5	54.8	47.4	35.2	44.2
North Dakota.....	419	343,746	232	197,983	150	113,383	179.3	203.2	80.6	73.6	54.7	74.6
South Dakota.....	449	411,790	338	264,159	169	127,143	165.7	223.9	32.8	55.9	100.0	107.8
Nebraska.....	1,227	979,345	882	598,703	404	313,427	203.7	212.5	39.1	63.6	118.3	91.0
Kansas.....	1,766	1,409,778	1,109	787,189	567	374,496	211.5	276.4	59.2	79.1	96.6	110.2
SOUTH ATLANTIC:												
Delaware, Maryland, and District of Columbia.....	1,399	1,270,721	1,249	936,805	1,024	759,508	36.6	67.3	12.0	35.6	22.0	23.3
Virginia.....	561	453,322	341	170,884	178	99,060	215.2	357.6	64.5	165.3	91.6	72.5
West Virginia.....	753	675,094	439	255,471	262	168,633	187.4	300.3	71.5	164.2	67.6	51.5
North Carolina.....	921	631,925	453	261,078	248	131,013	271.4	382.3	103.3	142.0	82.7	99.3
South Carolina.....	721	533,850	683	452,456	261	145,357	176.2	267.3	5.6	18.0	161.7	211.3
Georgia.....	915	583,891	697	417,969	384	232,711	138.3	150.9	31.3	39.7	81.5	79.6
Florida.....	678	471,035	455	286,053	265	156,700	155.8	200.6	49.0	64.7	71.7	82.5
EAST SOUTH CENTRAL:												
Kentucky.....	1,031	759,383	907	635,829	585	301,794	76.2	151.6	13.7	19.4	55.0	110.7
Tennessee.....	1,008	778,651	656	455,212	416	247,764	142.3	214.3	53.6	71.0	57.7	83.7
Alabama.....	806	602,050	456	286,936	343	208,533	135.0	188.7	76.8	109.8	32.9	37.6
Mississippi.....	451	272,046	407	263,793	288	161,433	56.6	68.5	10.8	3.1	41.3	63.4
WEST SOUTH CENTRAL:												
Arkansas.....	456	338,417	360	242,267	244	157,814	86.9	114.4	26.7	39.7	47.5	53.5
Louisiana.....	669	530,515	489	371,034	541	382,982	23.6	38.5	38.8	43.0	-9.6	-3.1
Oklahoma.....	1,101	885,880	785	581,580	414	264,604	165.9	234.8	40.2	52.3	89.6	119.8
Texas.....	2,531	1,968,423	2,021	1,348,966	1,275	798,219	98.5	149.4	25.2	45.9	58.5	70.9
MOUNTAIN:												
Montana.....	732	969,498	514	625,918	319	360,768	129.5	168.7	42.4	54.9	61.1	73.5
Idaho.....	469	450,753	324	334,063	188	171,125	149.5	163.4	44.8	34.9	72.3	96.2
Wyoming.....	261	259,786	163	149,356	96	77,811	233.9	60.1	73.9	91.9	91.9	91.9
Colorado.....	1,269	1,269,608	1,166	999,864	918	775,045	38.2	63.8	8.8	27.0	27.0	29.0
New Mexico.....	256	223,510	158	119,088	83	66,981	208.4	233.7	62.0	87.7	77.8	77.8
Arizona.....	436	451,163	217	219,798	148	130,663	194.6	245.3	100.9	105.3	46.6	68.2
Utah.....	1,215	937,869	401	365,399	198	159,686	513.6	487.3	203.0	156.7	102.5	128.8
Nevada.....	190	154,012	147	113,636	78	77,264	.....	99.3	29.2	35.5	.....	47.1
PACIFIC:												
Washington.....	1,112	1,093,365	1,078	890,309	885	800,441	25.6	36.6	3.2	24.2	21.8	10.0
Oregon.....	636	583,195	532	387,119	467	416,424	36.2	40.0	19.5	50.6	13.9	-7.0
California.....	6,167	7,132,056	5,738	5,823,203	3,128	3,094,193	97.2	130.5	7.5	22.5	83.4	88.2

¹ A minus sign (-) denotes decrease. Percentages are omitted when base is less than 100.

EMPLOYEES, SALARIES, AND WAGES.

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CENTRAL ELECTRIC STATIONS—EMPLOYEES AND SALARIES AND WAGES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

Table 91

DIVISION AND STATE.	SALARIED EMPLOYEES.											
	AGGREGATE.		Total.		Officers of corporations.		Superintendents and managers.		Clerks, stenographers, and other salaried employees.		WAGE EARNERS.	
	Number.	Salaries and wages.	Number.	Salaries.	Number.	Salaries.	Number.	Salaries.	Number.	Salaries.	Number.	Wages.
UNITED STATES.....	105,541	\$95,241,858	35,406	\$36,787,701	2,323	\$5,136,068	5,218	\$8,670,814	27,865	\$22,980,829	70,135	\$58,454,157
GEOGRAPHIC DIVISIONS:												
New England.....	10,157	8,763,855	4,172	4,063,488	358	688,986	426	896,333	3,388	2,476,169	5,985	4,700,367
Middle Atlantic.....	32,048	29,735,092	10,313	11,048,555	550	1,474,704	988	2,106,990	8,775	7,466,861	21,735	18,686,537
East North Central.....	24,361	22,850,710	9,230	9,537,466	443	1,027,522	1,131	1,876,674	7,656	6,633,270	15,131	13,313,244
West North Central.....	12,231	9,612,183	3,093	2,863,231	231	366,301	803	1,081,030	2,059	1,415,900	9,138	6,748,952
South Atlantic.....	5,948	4,619,638	1,888	1,793,731	202	340,667	550	676,399	1,136	776,665	4,060	2,826,107
East South Central.....	3,296	2,412,130	865	801,956	81	129,061	255	302,316	529	370,579	2,431	1,610,174
West South Central.....	4,757	3,723,235	1,612	1,391,233	130	232,098	410	489,559	1,072	669,576	3,145	2,332,002
Mountain.....	4,828	4,716,199	1,583	1,862,440	163	347,935	308	515,785	1,112	998,720	3,245	2,853,759
Pacific.....	7,915	8,808,616	2,650	3,426,601	165	528,784	347	723,728	2,138	2,173,089	5,265	5,383,015
NEW ENGLAND:												
Maine.....	772	619,739	295	248,337	77	69,093	68	85,547	150	93,697	477	371,402
New Hampshire.....	732	603,027	206	190,002	49	68,151	38	51,221	119	70,630	526	413,025
Vermont.....	443	350,735	142	117,594	25	23,675	43	48,802	74	45,117	301	233,141
Massachusetts.....	5,482	4,557,883	2,844	2,624,956	124	296,610	185	491,240	2,535	1,835,106	2,638	1,932,927
Rhode Island.....	790	760,323	200	272,556	22	66,996	21	44,142	157	161,418	590	487,767
Connecticut.....	1,938	1,872,148	485	610,043	61	162,461	71	177,381	353	270,201	1,453	1,262,105
MIDDLE ATLANTIC:												
New York.....	16,248	15,314,748	6,218	6,553,687	267	798,752	528	1,155,556	5,423	4,599,379	10,080	8,761,061
New Jersey.....	5,065	4,821,852	1,300	1,531,616	59	214,217	108	238,758	1,133	1,078,641	3,765	3,290,236
Pennsylvania.....	10,735	9,598,492	2,795	2,963,262	224	461,735	352	712,676	2,219	1,788,841	7,940	6,635,240
EAST NORTH CENTRAL:												
Ohio.....	4,714	4,143,688	1,339	1,278,813	99	237,506	238	376,452	1,002	664,855	3,375	2,864,875
Indiana.....	2,897	2,371,606	752	758,244	95	177,552	163	207,927	494	372,765	2,145	1,613,362
Illinois.....	9,294	8,636,523	4,723	4,908,549	107	330,886	342	672,885	4,274	3,899,778	4,571	3,732,974
Michigan.....	4,738	5,223,067	1,716	1,982,171	62	160,963	234	419,401	1,420	1,401,807	3,022	3,240,996
Wisconsin.....	2,718	2,475,826	700	614,689	80	120,615	154	200,009	466	294,065	2,018	1,861,137
WEST NORTH CENTRAL:												
Minnesota.....	2,520	2,011,137	608	628,147	47	86,242	144	230,501	417	311,404	1,912	1,382,990
Iowa.....	2,083	1,679,790	653	594,631	55	70,478	167	225,801	431	296,352	1,430	1,085,159
Missouri.....	3,787	2,776,597	817	674,369	39	74,368	142	185,697	636	414,304	2,950	2,102,228
North Dakota.....	419	343,746	98	101,309	11	15,412	38	53,788	49	32,109	321	242,437
South Dakota.....	449	411,790	120	127,295	21	17,790	47	68,962	52	40,543	329	284,495
Nebraska.....	1,227	979,345	329	332,054	32	64,330	109	127,197	188	140,527	898	647,291
Kansas.....	1,766	1,409,778	468	405,426	26	37,681	156	189,084	286	178,661	1,298	1,004,352
SOUTH ATLANTIC:												
Delaware, Maryland, and District of Columbia.....	1,399	1,270,721	639	592,899	32	86,598	72	119,916	535	386,355	760	677,852
Virginia.....	561	453,322	149	151,110	20	35,215	54	65,076	75	50,819	412	302,212
West Virginia.....	753	675,094	183	204,247	31	43,681	66	93,562	84	67,004	570	470,847
North Carolina.....	921	631,925	289	240,617	43	61,264	102	124,101	94	55,252	682	391,306
South Carolina.....	721	533,850	205	216,386	27	54,354	71	83,232	107	78,900	516	317,464
Georgia.....	915	583,891	260	208,416	28	37,851	114	108,440	118	62,125	655	375,475
Florida.....	678	471,035	213	180,086	21	21,704	71	82,072	121	76,310	465	290,949
EAST SOUTH CENTRAL:												
Kentucky.....	1,031	759,383	316	271,701	40	61,051	73	96,512	203	114,138	715	487,682
Tennessee.....	1,008	778,651	282	301,905	23	48,814	92	106,607	167	147,384	726	476,846
Alabama.....	806	602,050	157	151,293	8	11,256	54	61,916	95	78,121	649	450,757
Mississippi.....	451	272,046	110	77,157	10	7,940	36	38,281	64	30,936	341	194,890
WEST SOUTH CENTRAL:												
Arkansas.....	456	338,417	184	143,970	22	27,549	65	66,551	97	49,870	272	194,447
Louisiana.....	669	530,515	247	210,944	14	29,084	52	59,568	181	122,292	422	319,571
Oklahoma.....	1,101	885,880	318	287,466	34	42,771	93	120,512	191	124,183	783	598,414
Texas.....	2,531	1,968,423	863	748,853	60	132,694	200	242,928	603	373,231	1,668	1,219,570
MOUNTAIN:												
Montana.....	732	999,498	221	361,105	20	93,087	66	122,553	135	145,465	511	608,393
Idaho.....	469	450,753	229	249,189	15	33,966	22	40,188	192	175,135	240	201,564
Wyoming.....	261	259,788	103	104,013	14	13,748	29	45,823	60	44,442	158	155,773
Colorado.....	1,269	1,269,608	373	418,430	33	68,146	83	141,706	257	208,578	896	851,178
New Mexico.....	256	222,510	92	76,766	26	16,165	28	37,888	38	22,713	164	146,744
Arizona.....	436	451,163	164	188,245	30	53,415	34	54,707	100	80,123	272	262,918
Utah.....	1,215	937,869	338	400,617	17	51,866	33	58,928	288	289,823	877	537,252
Nevada.....	190	154,012	63	64,075	8	17,642	13	13,992	42	32,441	127	89,937
PACIFIC:												
Washington.....	1,112	1,093,365	330	329,557	26	40,468	55	81,142	249	207,947	782	763,808
Oregon.....	636	583,195	210	246,577	25	50,801	51	74,980	134	120,796	426	336,618
California.....	6,167	7,132,066	2,110	2,849,467	114	437,515	241	597,606	1,755	1,844,846	4,057	4,282,589

Output of central electric stations per employee.—An attempt has been made for this census to show in a detailed way what may be termed the "labor efficiency" of central electric stations, classified according to the form of ownership and according to whether they generate current or merely purchase from other companies. While satisfactory data are not available for 1907, the figures for 1912 are somewhat more

dependable, and comparisons can, therefore, best be made only for the last two census periods.

As shown in Table 92, the average amount of current generated per employee for all stations was 241,028 kilowatt hours in 1917, as compared with only 145,826 kilowatt hours in 1912. To indicate the condition correctly, however, the entire output of such stations, including current purchased as well as generated,

should be considered. Accordingly, we find that the average output of such stations per employee, including current purchased for distribution to customers, as well as current generated by the plant itself, was 299,072 kilowatt hours in 1917, and 174,637 kilowatt hours in 1912. The average for plants purchasing all current has apparently decreased from 235,388 kilowatt hours in 1912 to only 210,497 kilowatt hours in 1917. This decrease is accounted for by the change

already referred to in other portions of the report, which took place in some of the large stations in New York. With these general figures for all stations in the United States should be compared the data for hydroelectric stations as presented in Chapter III. In these large plants the average number of kilowatt hours generated per employee was 544,137, and the average total output per employee was 625,983 kilowatt hours.

Table 92

Table 92		OUTPUT OF CENTRAL ELECTRIC STATIONS AND AVERAGE OUTPUT PER EMPLOYEE: 1917, 1912, AND 1907.									
DIVISION. 1	Census year.	Number of employees.			Output of stations (kilowatt hours).			Average output per employee (kilowatt hours).		Average amount generated per employee (kilowatt hours).	
		Total.	In plants generating all or part of current.	In plants purchasing all current.	Plants generating all or part of current.		Plants purchasing all current.	Plants generating all or part of current.	Plants purchasing all current.		
					Generated.	Purchased.					
United States.....	1917	105,541	99,666	5,875	25,438,303,272	4,369,075,114	1,236,670,848	299,072	210,497	241,028	
	1912	79,335	73,940	5,395	11,569,109,885	1,343,583,623	1,269,918,982	174,637	235,388	145,826	
	1907	47,632	(*)	(*)	5,862,276,737	(*)	(*)			123,074	
New England.....	1917	10,157	9,487	670	1,835,584,072	433,356,678	144,754,181	239,163	216,051	180,721	
	1912	7,352	6,838	514	865,379,442	38,353,082	96,468,204	132,163	191,572	117,707	
	1907	5,088	(*)	(*)	473,802,067	(*)	(*)			93,121	
Middle Atlantic.....	1917	32,048	30,401	1,647	7,659,317,763	1,486,928,937	430,451,842	300,853	261,355	238,995	
	1912	24,022	21,754	2,268	3,548,605,305	206,296,966	783,105,328	172,608	345,285	147,723	
	1907	13,977	(*)	(*)	2,009,304,160	(*)	(*)			143,758	
East North Central.....	1917	24,361	22,993	1,368	5,757,150,135	348,216,198	267,389,624	265,532	195,460	236,327	
	1912	19,233	18,102	1,131	2,527,964,097	106,610,018	170,132,494	145,540	150,427	131,439	
	1907	10,324	(*)	(*)	1,075,933,354	(*)	(*)			104,217	
West North Central.....	1917	12,231	11,553	678	1,776,475,523	637,345,129	153,162,909	208,935	225,904	145,244	
	1912	7,892	7,239	653	712,585,442	71,370,825	112,164,613	108,298	171,768	90,293	
	1907	5,007	(*)	(*)	386,180,647	(*)	(*)			77,128	
South Atlantic.....	1917	5,948	5,470	478	1,745,295,143	346,637,916	69,527,318	382,437	145,455	293,426	
	1912	4,317	4,037	280	729,896,397	369,514,227	38,202,431	272,334	136,437	169,075	
	1907	2,622	(*)	(*)	266,437,175	(*)	(*)			101,616	
East South Central.....	1917	3,296	3,167	129	1,048,814,771	337,120,228	18,470,623	487,618	143,188	318,208	
	1912	2,426	2,351	75	227,664,808	7,988,926	7,989,846	100,236	106,131	93,844	
	1907	1,682	(*)	(*)	118,631,967	(*)	(*)			72,691	
West South Central.....	1917	4,757	4,552	205	482,645,862	113,661,810	43,941,915	130,999	214,351	101,460	
	1912	3,655	3,634	21	233,947,656	37,069,063	1,674,415	74,584	79,734	64,008	
	1907	2,474	(*)	(*)	138,755,643	(*)	(*)			56,086	
Mountain.....	1917	4,828	4,547	281	2,036,194,737	301,966,372	36,845,353	514,221	131,122	421,74	
	1912	3,090	2,888	202	845,393,882	160,585,745	27,615,785	348,331	136,712	273,590	
	1907	2,028	(*)	(*)	381,082,187	(*)	(*)			187,896	
Pacific.....	1917	7,915	7,496	419	3,096,825,266	363,841,846	72,127,083	461,069	172,141	391,260	
	1912	7,348	7,097	251	1,877,662,856	345,772,811	30,596,866	313,292	121,896	255,534	
	1907	4,480	(*)	(*)	1,012,199,587	(*)	(*)			225,937	

¹ See p. 18 for states composing the several geographic divisions.

² Figures not available.

It is perhaps more significant to note some of the averages for municipal and commercial stations taken separately. Accordingly, it appears that the average amount of current generated per employee in the former is only 95,684 kilowatt hours, while in the latter it is 257,702 kilowatt hours. The average output of the so-called generating stations, including purchased current, is 113,729 for municipal plants and 318,387, or nearly three times as large, for commercial stations. The difference was not so marked in 1912. In 1917, also, the average output per employee of plants purchasing all current was 243,165 kilowatt hours for commercial stations and 111,350 kilowatt hours for municipal plants.

Those geographic divisions which led in the average output per employee for commercial generating stations are the Mountain division, 535,687 kilowatt hours; East South Central, 527,159; Pacific, 486,942

kilowatt hours; and the South Atlantic, 458,093. Municipal plants report the highest output of generating stations per employee in the Pacific division, 254,772 kilowatt hours; in the East North Central, 150,524 kilowatt hours; and in the New England, 137,186 kilowatt hours. The highest averages for commercial plants are found in the states with extensive water-power development. The lowest average output per employee for this group of stations is reported under both classes of ownership in the West South Central division, where small oil and gas using plants are very common. The output in this division is 146,801 kilowatt hours for commercial stations and only 53,504 kilowatt hours for municipal plants. The largest average output per commercial station which purchases all current is found in the West North Central division, 296,884 kilowatt hours. This is closely followed by the Middle Atlantic, the East

North Central, the New England, and the West South Central divisions. Municipal purchasing plants report the highest average in the Pacific, 175,361 kilowatt hours, and the Middle Atlantic, 125,546 kilowatt hours. The lowest average for this kind of plant is

reported by commercial stations in the Mountain division, 133,350 kilowatt hours, and by municipal stations in the East South Central division, 51,391 kilowatt hours.

Table 93

Table 93		OUTPUT OF COMMERCIAL CENTRAL ELECTRIC STATIONS AND AVERAGE OUTPUT PER EMPLOYEE: 1917, 1912, AND 1907.									
DIVISION.	Census year.	Number of employees.			Output of stations (kilowatt hours).			Average output per employee (kilowatt hours).		Average amount generated per em- ployee (kilowatt hours).	
		Total.	In plants generat- ing all or part of cur- rent.	In plants pur- chasing all cur- rent.	Plants generating all or part of current.		Plants purchasing all current.	Plants generat- ing all or part of cur- rent.	Plants pur- chasing all cur- rent.		
					Generated.	Purchased.					
United States.....	1917	94,679	90,260	4,419	24,398,983,188	4,338,662,287	1,074,545,276	318,387	243,165	257,702	
	1912	71,395	66,583	4,812	11,031,583,155	1,817,617,940	1,207,304,268	185,471	250,894	154,515	
	1907	42,066	(1)	(1)	5,572,813,949	(1)	(1)	(1)	(1)	132,478	
New England.....	1917	9,533	8,972	561	1,776,289,676	422,000,426	135,425,719	245,016	241,400	186,331	
	1912	6,850	6,376	474	826,143,047	36,497,608	94,898,001	135,266	200,196	120,606	
	1907	4,731	(1)	(1)	450,903,003	(1)	(1)	(1)	(1)	95,308	
Middle Atlantic.....	1917	31,458	29,890	1,568	7,618,232,163	1,485,696,667	420,533,674	304,581	269,197	242,172	
	1912	23,545	21,292	2,253	3,519,216,083	206,203,491	781,767,031	174,968	346,989	149,468	
	1907	13,520	(1)	(1)	1,983,341,586	(1)	(1)	(1)	(1)	146,697	
East North Central.....	1917	20,992	20,245	747	5,348,721,560	343,004,990	197,237,840	281,142	264,040	254,798	
	1912	16,592	15,761	831	2,280,324,043	103,015,236	135,477,620	151,218	163,030	137,435	
	1907	8,159	(1)	(1)	960,398,248	(1)	(1)	(1)	(1)	117,699	
West North Central.....	1917	9,874	9,415	459	1,623,567,900	633,810,940	136,269,850	239,764	296,884	164,429	
	1912	6,476	5,876	600	650,867,731	71,171,803	109,120,292	122,879	181,867	100,505	
	1907	4,124	(1)	(1)	342,800,564	(1)	(1)	(1)	(1)	83,123	
South Atlantic.....	1917	4,628	4,390	238	1,669,198,197	341,829,401	39,885,454	458,093	167,586	360,674	
	1912	3,327	3,154	173	680,571,954	369,399,444	25,558,820	332,901	147,722	204,860	
	1907	1,924	(1)	(1)	236,136,778	(1)	(1)	(1)	(1)	122,732	
East South Central.....	1917	2,666	2,558	108	1,012,378,561	326,395,376	17,391,411	527,159	161,032	379,737	
	1912	1,924	1,855	69	195,999,962	7,986,426	7,664,631	109,966	111,080	191,871	
	1907	1,194	(1)	(1)	97,074,576	(1)	(1)	(1)	(1)	81,302	
West South Central.....	1917	3,953	3,781	172	441,694,042	112,361,810	40,357,001	146,991	234,634	111,736	
	1912	3,117	3,193	14	211,050,496	36,428,503	859,127	79,755	61,366	67,709	
	1907	2,219	(1)	(1)	126,947,066	(1)	(1)	(1)	(1)	56,768	
Mountain.....	1917	4,578	4,329	249	2,017,395,528	301,684,882	33,204,041	535,687	133,350	440,652	
	1912	2,957	2,777	180	836,590,469	160,410,233	26,004,972	359,021	144,472	282,919	
	1907	1,962	(1)	(1)	375,815,364	(1)	(1)	(1)	(1)	191,547	
Pacific.....	1917	6,997	6,680	317	2,891,595,547	361,177,795	54,240,295	496,942	171,105	413,262	
	1912	6,607	6,389	218	1,830,820,270	326,505,196	26,961,894	337,662	119,091	277,103	
	1907	4,233	(1)	(1)	1,000,486,774	(1)	(1)	(1)	(1)	236,354	

¹ Figures not available.

Table 94

Table 94		OUTPUT OF MUNICIPAL CENTRAL ELECTRIC STATIONS AND AVERAGE OUTPUT PER EMPLOYEE: 1917, 1912, AND 1907.									
DIVISION.	Census year.	Number of employees.			Output of stations (kilowatt hours).			Average output per employee (kilowatt hours).		Average amount generated per em- ployee (kilowatt hours).	
		Total.	In plants generat- ing all or part of current.	In plants pur- chasing all current.	Plants generating all or part of current.		Plants purchasing all current.	Plants generat- ing all or part of current.	Plants pur- chasing all current.		
					Generated.	Purchased.					
United States.....	1917	10,862	9,406	1,456	1,039,320,089	39,412,827	162,125,572	113,729	111,350	95,684	
	1912	7,940	7,357	583	537,526,730	25,965,683	62,614,694	76,593	107,401	67,699	
	1907	5,566	(1)	(1)	289,462,788	(1)	(1)	(1)	(1)	52,006	
New England.....	1917	624	515	109	59,294,396	11,356,262	9,328,471	137,186	85,582	95,023	
	1912	502	462	40	39,236,395	1,855,424	3,575,293	81,856	89,380	78,180	
	1907	357	(1)	(1)	22,899,064	(1)	(1)	(1)	(1)	64,143	
Middle Atlantic.....	1917	590	511	79	41,085,600	1,232,270	9,918,168	84,771	126,546	69,637	
	1912	477	462	15	29,389,222	95,495	1,338,297	63,829	89,220	61,613	
	1907	457	(1)	(1)	25,982,574	(1)	(1)	(1)	(1)	56,811	
East North Central.....	1917	3,369	2,748	621	408,428,566	5,211,208	70,151,784	150,534	112,966	121,231	
	1912	2,641	2,341	300	247,640,054	3,594,782	34,654,874	107,319	115,516	93,768	
	1907	2,165	(1)	(1)	115,625,106	(1)	(1)	(1)	(1)	53,407	
West North Central.....	1917	2,357	2,138	219	152,907,623	3,534,189	16,893,059	73,172	77,137	64,874	
	1912	1,416	1,363	53	61,727,711	199,022	3,044,321	45,434	57,440	43,598	
	1907	883	(1)	(1)	43,380,983	(1)	(1)	(1)	(1)	49,128	
South Atlantic.....	1917	1,320	1,080	240	76,096,946	4,808,515	29,641,864	74,912	123,508	57,649	
	1912	990	883	107	49,325,343	114,783	12,646,611	55,991	118,193	49,824	
	1907	698	(1)	(1)	30,309,397	(1)	(1)	(1)	(1)	43,410	
East South Central.....	1917	630	609	21	36,436,210	1,024,852	1,979,212	61,512	51,391	57,835	
	1912	502	496	6	31,664,846	2,500	295,315	63,845	49,219	63,077	
	1907	438	(1)	(1)	21,557,391	(1)	(1)	(1)	(1)	49,218	
West South Central.....	1917	804	771	33	40,951,820	300,000	3,584,914	53,504	108,634	59,935	
	1912	538	531	7	22,867,169	660,560	815,268	44,365	116,470	42,560	
	1907	255	(1)	(1)	12,808,587	(1)	(1)	(1)	(1)	50,230	
Mountain.....	1917	260	218	32	18,889,209	281,490	3,641,312	87,939	113,791	75,557	
	1912	133	111	22	8,803,413	175,512	1,610,813	80,891	73,219	66,191	
	1907	66	(1)	(1)	5,216,823	(1)	(1)	(1)	(1)	79,043	
Pacific.....	1917	918	816	102	205,229,719	2,664,051	17,896,788	254,772	175,361	223,562	
	1912	741	708	33	46,842,586	19,267,615	4,633,972	93,376	140,423	63,215	
	1907	247	(1)	(1)	11,712,763	(1)	(1)	(1)	(1)	47,420	

¹ Figures not available.

CHAPTER X.—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED GROUPS OF CENTRAL STATIONS.

Purpose and method of selection.—On account of the wide differences which exist between the various central electric light and power stations, resulting from the character of their ownership, their size, and the nature and extent of their business, as well as from the type of primary power used, it is a difficult matter to draw wholly satisfactory conclusions, based on the general statistics of the industry, regarding the financial and operating efficiency of typical stations. For this report, therefore, an attempt has been made to compile such statistics for carefully selected groups of stations, commercial and municipal, plants being arranged according to the kilowatt capacity of their dynamos and their total output in kilowatt hours and classified according to the source of primary power used, whether steam, water, oil, or gas. Typical plants purchasing all of their current have also been separated from those which generate current. From the resulting data here presented it is hoped that some profitable study can be made of the economics of large-scale production in the electric light and power business, together with a comparative survey of the conditions which result from the utilization of different kinds of primary power. Incidentally, also, it may be possible to draw some conclusions regarding the comparative efficiency of municipal and commercial plants, though the former are in most groups too few to serve as a basis for fair comparison.

The aim has been to select what may in general be termed "representative" plants, which, so far as the general nature of their business and conditions of operation are concerned, will lie between either extreme. The probable accuracy of the schedules returned by the various stations was also borne in mind. Accordingly, the following classes of plants were omitted from these special tabulations: All composite plants, for which the balance sheets and operating accounts are frequently questionable; unincorporated plants; plants which do only street lighting; plants which sell their entire output for power or to other companies, or both; and in the case of generating stations, none is included unless it produces 90 per cent or more of its total output of current. Further, in the case of steam plants, none was included which used any water power or any internal-combustion engines. No plant, in fact, was selected which used more than one type of primary power, with one

exception. In order not to omit those important hydroelectric plants which merely use some motive power other than water as an auxiliary, a water-power plant was defined as one "of which at least 75 per cent of the primary power equipment consists of water wheels or turbines."

The selections having been made in this manner for the purpose of studying the comparative investment data, stations were arranged in 10 different capacity groups, ranging from under 200 kilowatts to over 100,000 kilowatts. The same stations were rearranged, according to their kilowatt output, into 11 groups, ranging from under 200,000 kilowatts to over 200,000,000 kilowatts, for the purpose of studying unit costs and income and general operating statistics.

The number of stations which meet all of the requirements imposed, and which, accordingly, are included in the special tabulations, are 840 commercial generating stations, consisting of 370 steam plants, 229 water power, 215 oil, and 26 gas; 591 municipal generating plants, comprising 285 steam, 52 water power, 240 oil, and 14 gas; 571 commercial purchasing stations, and 373 municipal purchasing stations. Hence these stations represent, in the case of generating stations, 25.1 per cent of all commercial and 33.3 per cent of all municipal stations generating current, while 65.1 per cent of all commercial purchasing plants are included and 68.9 per cent of the corresponding municipal plants.

Comparative value of plant and equipment of generating plant, grouped according to kilowatt capacity of dynamos.—In Table 95 are summarized the results of a portion of the special tabulation. Here is shown, for a total of 830 commercial and 586 municipal stations, the average capacity of dynamos per station and per machine, together with the value of plant and equipment per kilowatt capacity of dynamos.

For both steam plants and water-power plants a sufficiently large number of commercial stations are to be found under every grouping to enable reasonable conclusions to be drawn from the figures presented. Oil and gas plants are of significance only in the two lowest groups. In all classes, however, except in the case of steam plants, there are few municipal stations outside the lowest group. Municipal and commercial coal-using plants can, however, be compared as far as the fifth group, which reports a dynamo capacity of less than 5,000 kilowatts.

Table 95

TOTAL KILOWATT CAPACITY OF DYNAMOS PER STATION.	COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE CAPACITY OF DYNAMOS PER STATION AND PER MACHINE, AND VALUE OF PLANT AND EQUIPMENT PER KILOWATT CAPACITY OF DYNAMOS, FOR GROUPS OF STATIONS SELECTED ACCORDING TO THE KIND OF PRIMARY POWER USED: 1917.							
	Number of stations taken.		Average capacity of dynamos per station.		Average capacity of dynamos per machine.		Value of plant and equipment per kilowatt capacity of dynamos.	
	Commercial.	Municipal.	Commercial.	Municipal.	Commercial.	Municipal.	Commercial.	Municipal.
STEAM (COAL-USING) PLANTS.								
Under 200 kw.....	138	173	100	94	62	65	\$211	\$182
200 but under 500 kw.....	96	69	300	306	123	135	262	158
500 but under 1,000 kw.....	31	20	696	637	211	190	390	158
1,000 but under 2,000 kw.....	31	11	1,370	1,208	357	380	253	151
2,000 but under 5,000 kw.....	26	8	3,120	3,132	670	716	253	137
5,000 but under 10,000 kw.....	17	2	7,697	5,250	1,190	1,750	272	121
10,000 but under 20,000 kw.....	11	2	14,807	13,200	2,172	3,300	333	188
20,000 but under 50,000 kw.....	9	.....	30,890	.....	2,106	.....	240	.....
50,000 but under 100,000 kw.....	3	.....	73,500	.....	8,820	.....	201	.....
100,000 kw. and over.....	8	.....	198,918	.....	5,413	.....	295	.....
WATER-POWER PLANTS.¹								
Under 200 kw.....	105	30	87	98	69	89	360	262
200 but under 500 kw.....	52	7	297	343	158	171	313	207
500 but under 1,000 kw.....	20	9	687	607	292	287	273	210
1,000 but under 2,000 kw.....	17	3	1,284	1,267	316	475	380	255
2,000 but under 5,000 kw.....	13	.....	2,622	.....	631	.....	316	.....
5,000 but under 10,000 kw.....	4	.....	7,975	.....	778	.....	259	.....
10,000 but under 20,000 kw.....	6	.....	14,445	.....	1,354	.....	425	.....
20,000 but under 50,000 kw.....	10	2	30,895	29,600	2,207	3,947	381	221
PLANTS USING ONLY OIL.²								
Under 200 kw.....	189	232	42	40	27	27	302	257
200 but under 500 kw.....	13	5	324	339	105	141	369	214
500 but under 1,000 kw.....	5	.....	3,430	.....	686	.....	424	.....
1,000 but under 20,000 kw.....	3	.....	16,200	.....	2,314	.....	330	.....
PLANTS USING ONLY GAS.³								
Under 200 kw.....	14	9	110	92	70	55	158	139
200 but under 500 kw.....	6	4	330	245	116	98	163	178
500 but under 1,000 kw.....	3	.....	694	.....	160	.....	421	.....

¹ Exclusive of 2 commercial plants of the class "50,000 but under 100,000 kilowatts," to avoid disclosure of individual operations, and a single municipal plant of the class "2,000 but under 5,000 kilowatts."

² Exclusive of 2 commercial plants of the class "500 but under 1,000 kilowatts," 2 of the class "1,000 but under 2,000 kilowatts," and 1 of the class "5,000 but under 10,000 kilowatts," to avoid disclosure of individual operations, and all single municipal plants, including 1 of the class "2,000 but under 5,000 kilowatts," 1 of the class "5,000 but under 10,000 kilowatts," and 1 of the class "10,000 but under 20,000 kilowatts."

³ Exclusive of 1 commercial plant of the class "1,000 but under 2,000 kilowatts," and 2 of the class "2,000 but under 5,000 kilowatts," to avoid disclosure of individual operations, and a single municipal plant of the class "500 but under 1,000 kilowatts."

1. *Steam plants.*—Municipal and commercial steam plants show the closest relation in investment in the lowest group, the former reporting an average of \$182 per kilowatt capacity and the latter an average of \$211. From this point the divergence is marked, municipal plants reporting a far lower cost per kilowatt than is found in the commercial stations. Various reasons for this lower investment have already been suggested in earlier chapters of the report. Perhaps, however, mention should again be made of the following facts: As the size of stations grows larger commercial plants are constantly serving a wider territory, which embraces numerous municipalities in addition to that in which the plant is located. This makes necessary a heavy investment in distribution lines, transformers, meters, etc., which increases the per capacity investment by an indeterminate amount. At any rate, it very frequently happens that investment in the distribution system is far in excess of that in the generating plant itself. Again, commercial stations, as the figures show, keep their equipment

more nearly up to date than do municipal stations. This necessitates constant increase in investment. Further, it is also true that commercial stations are ordinarily disposed to keep a higher amount of reserve dynamo capacity than are the others. They also usually invest more in their buildings. Perhaps, also, in many cases they charge to capital account certain expenses of extension, renewal, or replacement which municipal plants may meet out of operating income, a practice which may make it possible for the time being to pay a high rate of dividends. Finally, a number of intangibles are no doubt included in the investment account of many commercial stations. Municipal plants, on the other hand, frequently do not carry on their books as investment that part of the value of plant and equipment the liability against which has been canceled by the liquidation of bonds originally issued to cover the cost of construction. Further, the value of real estate used by municipal plants is sometimes carried merely in the general accounts of a municipality, without being included in the value of the plant and equipment of the electric station. So far as intangibles are concerned, also, there is, of course, no opportunity to include such items in municipal plant investment. Other suggestions might be made, and as local conditions are not known it is possible that many of the figures for these selected but relatively small groups of municipal plants are not as representative as could be wished for. Beyond a doubt, however, the showing here made is a highly creditable one.

As coal-using plants increase in size, it does not appear from the figures in Table 95 that there is any marked tendency either to an increase or a decrease in the value of plant and equipment per kilowatt capacity of dynamos. To be sure, an abnormally high figure, \$390, is found in the third group of commercial stations. This figure, however, results from abnormal conditions reported by one or two of the schedules included, and should be omitted in discussing the general data. With this omission, it is found that the second group shows a somewhat higher per capacity investment than does the first, and from this point until the group between 5,000 and 10,000 kilowatt capacity is reached there is little change. The next group reports an average of \$333 per kilowatt, which again seems to be out of line with the figures on either side, and is probably due to the fact that the relatively few number of stations reporting do an extensive distribution business. From this point a rapid decrease is noted, to \$240 and \$201 in the two following groups. The group reporting "100,000 kilowatts and over" shows an increased investment, \$295. This group comprises those central stations which distribute current in densely populated territories frequently serving scores of municipalities. On account of the difficulties of line construction

which they must encounter, as well as because of the many additional expenses in investment which they must undergo in order to keep the public satisfied, it is not surprising to find that the cost per kilowatt of such plants is higher. Municipal plants show no very marked trend in the matter of investment as the size is increased.

2. *Water-power plants.*—Both commercial and municipal water-power plants report a much higher investment per kilowatt capacity of dynamos than do the corresponding groups of coal-using stations. Here again, however, the figures are much lower for municipal plants; nor does it seem possible to draw any definite conclusion regarding the economies in investment as the size of plant increases. The investment per kilowatt in the 10 commercial water-power plants in the group having a capacity ranging from 20,000 to 50,000 kilowatts is \$381, slightly higher than that of the 105 plants reported in the lowest group, \$360.

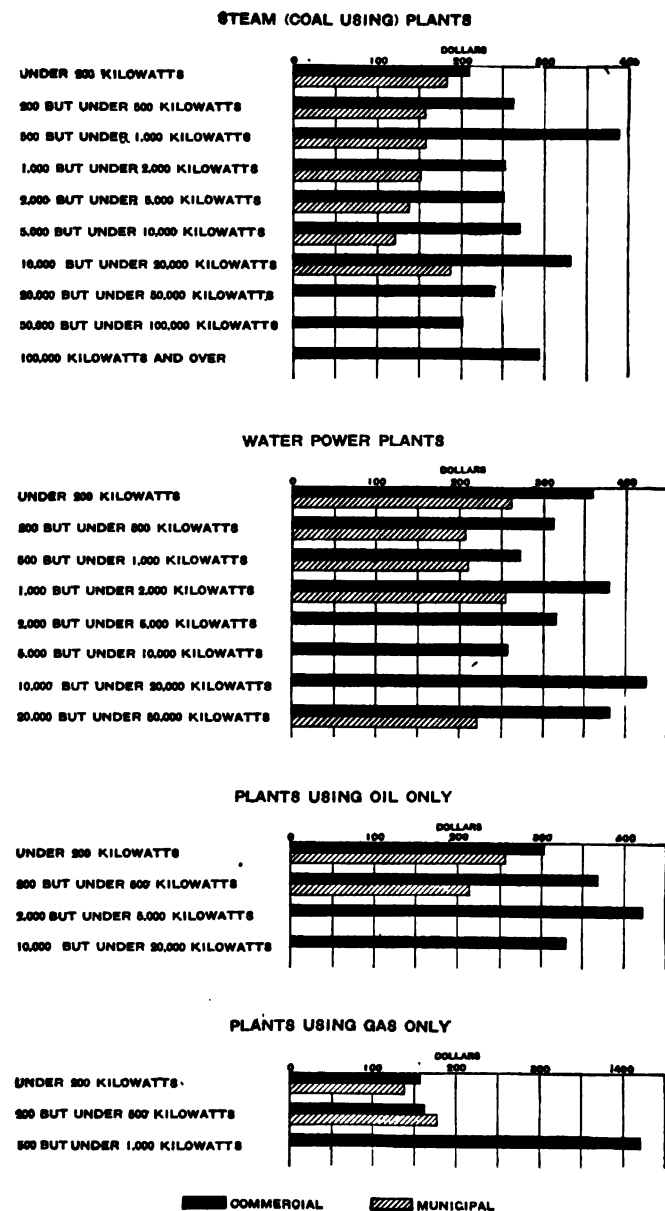
3. *Oil-using and gas-using plants.*—Plants using only oil report a relatively high investment. In fact, there is little difference between the per kilowatt capacity value figures of this class of plants and the water-power plants. Gas-using plants, on the other hand, report the lowest investment of all, except for the class of "500 but under 1,000 kilowatts," which shows a value of \$421 per kilowatt capacity. There are so few of these plants that the figures do not mean much.

Comparative value of plant and equipment of plant, grouped according to number of kilowatt hours generated.—Practically the same plants which were used in the tabulations summarized in Table 95 form the basis under a different classification for the figures which are presented in Table 96. Here, however, the classification is made on the basis of the number of kilowatt hours generated, and not only are operating and value data shown, but also the income and expenses per kilowatt hour sold. Similar figures are also presented for all commercial and municipal generating stations in the United States wherever it has been possible to secure these figures from the general tabulations.

First of all, attention should be called to the fact that in most groups under the different types of plants municipal stations report a larger number of kilowatt hours generated per kilowatt capacity of dynamos than do commercial stations. This, of course, may sometimes indicate that they have overestimated their output of current in cases where station meters are not used. However, in view of the fact that, as indicated by the

figures which show the percentage disposal of current, municipal plants in the lower groups ordinarily do a relatively greater lighting business than commercial plants, it is probable that they are simply using their dynamos more nearly to the full extent of their capacity and are not maintaining so high a reserve equipment as are commercial stations. From the nature of their business it is perfectly evident that this higher output per kilowatt capacity is not the result of a better load factor or better diversity factor.

DIAGRAM 16.—INVESTMENT IN PLANT AND EQUIPMENT PER KILOWATT CAPACITY OF DYNAMOS, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917.



COMPARATIVE STATISTICS.

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TABLE 96.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED GENERATING STATIONS, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS GENERATED AND THE TYPE OF PRIMARY POWER USED: 1917.

GROUP.	Number of stations.	Average dynamo capacity per station.	Kw. hours generated per kw. capacity of dynamo.	Average number of kw. hours generated per station.	PERCENTAGE DISPOSAL OF CURRENT.				INCOME PER KW. HOUR SOLD.						
					Light.	Pow-er.	Other companies.	Losses in distribution, etc.	Total from all sources (1).	Total from sale of current. ¹	Light. ¹	Pow-er. ¹	Other companies.	All other income.	Net income.
United States:															
Commercial.....	3,347	2,500	2,916	7,289,807	14.9	43.0	25.0	17.1	Cents. 1.968	Cents. 1.869	Cents. 5.621	Cents. 1.206	Cents. 0.768	Cents. 0.068	Cents. 0.387
Municipal.....	1,777	324	1,807	584,873	54.2	27.7	1.7	16.4	Cents. 3.911	Cents. 3.852	Cents. 4.930	Cents. 1.864	Cents. 1.547	Cents. 0.059	Cents. 0.910
STEAM (COAL-USING) PLANTS:²															
Under 200,000 kw. hours—															
Commercial.....	140	118	703	82,803	69.1	10.6	1.1	19.3	10.433	9.989	10.678	5.903	5.931	0.444	0.383
Municipal.....	168	101	810	82,101	75.1	6.3	1.2	17.4	9.947	9.722	10.061	6.346	6.000	0.224	0.925
200,000 but under 500,000 kw. hours—															
Commercial.....	66	283	1,106	318,465	55.0	22.8	3.6	18.6	7.828	7.377	8.811	4.288	5.000	0.451	0.426
Municipal.....	56	263	1,203	315,966	64.6	15.9	3.8	15.7	7.152	7.008	7.824	4.339	4.247	0.144	1.344
500,000 but under 1,000,000 kw. hours—															
Commercial.....	42	532	1,233	655,163	55.6	27.4	1.7	15.3	5.631	5.426	6.600	3.181	3.171	0.205	0.486
Municipal.....	26	416	1,597	664,659	54.5	25.3	1.1	19.1	5.477	5.392	6.319	3.511	2.763	0.086	0.920
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	26	860	1,560	1,342,497	46.8	27.6	5.5	20.6	5.707	5.458	7.473	2.498	3.338	0.250	0.704
Municipal.....	16	795	1,621	1,288,040	50.2	28.6	1.4	19.8	5.447	5.381	6.502	3.584	1.844	0.066	1.601
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	30	1,718	1,822	3,130,069	28.5	41.4	13.6	16.5	4.081	3.908	7.036	2.352	2.064	0.177	0.543
Municipal.....	11	1,663	2,141	3,560,131	46.6	31.7	3.7	18.0	3.350	3.305	4.500	1.766	1.459	0.045	0.850
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	19	4,166	1,685	7,021,922	24.7	42.0	13.9	19.4	3.876	3.755	7.461	2.297	1.567	0.122	0.438
Municipal.....	5	4,310	1,818	7,836,940	45.2	32.4	2.3	20.1	3.260	3.191	4.186	1.939	1.306	0.068	0.658
10,000,000 but under 20,000,000 kw. hours—															
Commercial.....	11	5,949	2,183	12,986,584	18.0	46.9	17.9	17.2	2.656	2.553	6.430	1.675	0.958	0.103	0.490
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	15	12,986	2,120	27,537,040	19.8	42.6	21.8	15.9	2.593	2.534	5.193	1.832	1.493	0.059	0.420
50,000,000 but under 100,000,000 kw. hours—															
Commercial.....	8	29,858	2,482	74,115,002	19.1	43.7	20.2	17.0	2.442	2.297	4.612	1.877	1.017	0.144	0.487
100,000,000 but under 200,000,000 kw. hours—															
Commercial.....	4	46,260	2,768	128,058,872	18.4	44.0	24.8	12.8	1.680	1.627	4.036	1.163	0.664	0.053	0.204
200,000,000 kw. hours and over—															
Commercial.....	9	186,260	3,120	581,210,537	26.9	31.6	24.9	16.5	2.591	2.487	4.939	1.565	1.006	0.104	0.553
WATER-POWER PLANTS:³															
Under 200,000 kw. hours—															
Commercial.....	116	123	579	71,485	66.2	16.4	2.3	15.1	8.271	7.931	8.908	4.560	3.825	0.340	1.108
Municipal.....	25	90	748	67,539	75.8	5.6	1.3	17.3	7.979	7.800	8.160	4.560	0.822	0.179	2.297
200,000 but under 500,000 kw. hours—															
Commercial.....	38	306	947	299,408	50.7	23.3	7.4	18.6	5.384	5.156	6.856	2.452	2.008	0.228	0.911
Municipal.....	11	268	1,260	337,448	63.8	20.2	.....	16.0	4.196	4.093	4.447	2.976	.....	0.102	1.604
500,000 but under 1,000,000 kw. hours—															
Commercial.....	16	475	1,518	720,479	44.2	20.6	17.2	18.0	3.570	3.435	4.762	2.378	1.287	0.135	0.874
Municipal.....	5	568	1,356	770,394	44.3	30.1	7.6	18.0	2.667	2.644	3.880	1.054	1.729	0.022	0.890
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	11	1,059	1,344	1,422,625	23.1	55.4	4.6	16.9	3.131	2.994	6.846	1.488	1.807	0.137	0.777
Municipal.....	6	925	1,317	1,218,660	37.0	40.4	4.7	17.8	2.602	2.545	3.918	1.378	1.769	0.058	1.000
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	16	1,802	1,708	3,077,245	12.9	37.8	32.5	16.8	1.994	1.928	5.719	1.354	1.088	0.067	0.243
Municipal.....	2	725	4,171	3,024,329	59.7	25.3	.....	15.0	2.007	1.988	2.860	1.110	.....	0.019	0.940
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	11	3,014	2,269	6,840,098	10.6	62.5	11.7	15.2	1.719	1.647	5.753	1.127	0.692	0.072	0.418
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	4	10,708	3,650	39,087,441	3.6	57.4	25.0	14.0	1.100	1.067	6.700	0.965	0.493	0.033	0.257
50,000,000 but under 100,000,000 kw. hours—															
Commercial.....	8	19,439	3,622	70,404,045	1.4	42.9	41.4	14.4	0.826	0.793	3.704	0.942	0.544	0.033	0.117
100,000,000 but under 200,000,000 kw. hours—															
Commercial.....	6	36,243	4,065	147,335,110	5.4	56.7	22.1	15.8	0.774	0.746	2.923	0.634	0.502	0.028	0.219
OIL-USING PLANTS:⁴															
Under 200,000 kw. hours—															
Commercial.....	190	47	763	35,522	71.5	13.0	0.4	15.1	11.768	11.348	12.394	5.717	7.300	0.420	0.496
Municipal.....	230	39	740	29,133	77.7	4.0	0.7	17.6	12.129	11.915	12.332	4.889	6.255	0.214	0.520
200,000 but under 500,000 kw. hours—															
Commercial.....	7	240	1,168	290,059	60.6	17.8	3.8	17.8	7.927	7.399	8.254	4.314	8.190	0.528	1.153
Municipal.....	5	276	1,203	332,549	50.3	22.5	.....	27.2	7.151	6.657	7.640	4.471	.....	0.494	2.079
500,000 but under 1,000,000 kw. hours—															
Commercial.....	4	294	2,250	660,912	51.3	32.5	.....	16.2	4.497	4.257	5.032	3.032	.....	0.240	0.598
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	4	1,710	1,874	3,204,172	34.6	35.8	14.9	14.7	4.871	4.482	7.265	2.950	1.683	0.389	1.445
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	3	3,217	2,225	7,157,782	25.9	28.3	18.7	27.1	4.860	4.640	8.394	3.251	1.536	0.219	1.218
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	3	13,733	2,590	35,575,411	31.6	38.6	8.4	21.4	3.196	3.102	4.723	2.018	1.966	0.094	0.870
GAS-USING PLANTS:⁵															
Under 200,000 kw. hours—															
Commercial.....	14	121	838	101,344	67.5	15.9	.....	16.6	7.596	7.507	8.516	3.237	.....	0.099	0.686
Municipal.....	8	81	826	67,010	84.0	0.6	.....	15.4	6.768	6.680	6.705	3.429	.....	0.088	1.073
200,000 but under 500,000 kw. hours—															
Commercial.....	6	305	1,146	349,219	48.9	26.7	.....	24.4	6.517	6.132	8.196	2.340	.....	0.396	0.953
Municipal.....	4	215	1,691	363,583	64.6	21.9	.....	13.5	5.782	5.782	5.134	2.563	.....	.....	2.016
500,000 but under 1,000,000 kw. hours—															
Commercial.....	2	440	1,408	617,288	39.5	52.7	.....	7.8	5.364	5.336	8.670	2.843	.....	0.028	1.654
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	3	2,098	648	1,359,005	45.2	32.3	1.6	20.9	4.014	3.792	4.880	2.399	1.307	0.222	0.575
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	3	2,136	1,308	2,820,116	33.8	39.0	15.2	12.0	2.625	2.490	4.060	1.554	1.360	0.135	0.655

(See footnotes at end of table.)

TABLE 96.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED GENERATING STATIONS, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS GENERATED AND THE TYPE OF PRIMARY POWER USED: 1917—Continued.

GROUP.	EXPENSES.														
	Total per kw. hour sold.	Sup- plies and mate- rials per kw. hour sold.	Salaries and wages.		Fuel.			Mis- cella- neous ex- penses per kw. hour sold.	Insur- ance per kw. hour sold.	Taxes.			Depreciation.		
			Per kw. hour sold.	Per cent of total ex- penses.	Per kw. hour gener- ated.	Per kw. hour sold.	Per cent of total ex- penses.			Per kw. hour sold.	Per cent of total ex- penses.	Per cent of in- vest- ment.	Per kw. hour sold.	Per cent of tota ex- penses.	Per cent of in- vest- ment.
United States:	Cents.	Cents.	Cents.		Cents.	Cents.		Cents.	Cents.	Cents.			Cents.		
Commercial.....	1.581	0.090	0.350	22.1	* 0.470	(?)	* 21.2	0.296	0.014	0.121	7.6	1.0	0.106	6.6	0.9
Municipal.....	3.001	0.400	0.852	28.3	* 1.100	(?)	* 34.7	0.401	0.026	0.016	0.5	0.1	0.196	6.4	1.6
STEAM (COAL-USING) PLANTS: ¹															
Under 200,000 kw. hours—															
Commercial.....	10.080	0.967	3.285	32.6	3.103	3.836	38.1	0.533	0.152	0.298	3.0	0.9	0.521	5.2	1.6
Municipal.....	9.022	1.193	2.816	31.2	3.292	3.983	44.1	0.245	0.108	0.005	(*)	(*)	0.067	1.0	0.3
200,000 but under 500,000 kw. hours—															
Commercial.....	7.401	0.554	2.148	29.0	2.286	2.809	38.0	0.532	0.155	0.251	3.4	1.0	0.335	4.5	1.3
Municipal.....	5.807	0.751	1.570	27.0	2.320	2.752	47.4	0.245	0.066	0.001	(*)	(*)	0.137	2.4	0.9
500,000 but under 1,000,000 kw. hours—															
Commercial.....	5.145	0.392	1.409	27.4	1.476	1.732	33.7	0.523	0.082	0.204	4.0	0.7	0.339	6.6	1.2
Municipal.....	4.557	0.630	1.324	29.1	1.612	1.990	43.7	0.195	0.059	0.007	0.2	(*)	0.171	3.7	1.4
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	4.913	0.341	1.289	26.2	1.297	1.632	33.2	0.349	0.076	0.211	4.3	0.8	0.450	9.2	1.8
Municipal.....	3.846	0.457	1.133	29.4	1.246	1.555	40.4	0.154	0.057	0.002	0.1	(*)	0.296	7.7	2.5
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	3.535	0.297	0.833	23.6	1.027	1.226	34.6	0.249	0.052	0.178	5.0	1.1	0.273	7.7	1.7
Municipal.....	2.500	0.327	0.629	25.2	0.891	1.087	43.5	0.090	0.037	0.017	0.7	0.2	0.256	10.2	3.1
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	3.438	0.218	0.797	23.2	0.900	1.107	32.2	0.287	0.046	0.186	5.4	1.0	0.367	10.7	2.0
Municipal.....	2.601	0.245	0.671	25.8	0.784	0.981	37.7	0.057	0.021	0.050	1.9	0.5	0.410	15.7	4.4
10,000,000 but under 20,000,000 kw. hours—															
Commercial.....	2.166	0.109	0.481	22.2	0.600	0.722	33.3	0.258	0.014	0.153	7.1	1.0	0.117	5.4	0.8
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	2.173	0.106	0.486	22.3	0.602	0.708	32.6	0.243	0.021	0.170	7.8	1.2	0.154	7.1	1.1
50,000,000 but under 100,000,000 kw. hours—															
Commercial.....	1.955	0.131	0.443	22.6	0.520	0.613	31.4	0.125	0.011	0.137	7.0	1.1	0.196	10.1	1.6
100,000,000 but under 200,000,000 kw. hours—															
Commercial.....	1.387	0.048	0.288	20.7	0.441	0.489	35.3	0.152	0.012	0.090	6.5	0.9	0.106	7.7	1.1
200,000,000 kw. hours and over—															
Commercial.....	2.038	0.130	0.494	24.2	0.462	0.541	26.5	0.292	0.021	0.204	10.0	1.9	0.133	6.5	1.2
WATER-POWER PLANTS: ⁴															
Under 200,000 kw. hours—															
Commercial.....	7.168	0.963	3.117	43.5	0.072	0.072	0.690	0.103	0.402	5.6	0.8	0.776	10.8	1.5	
Municipal.....	5.682	1.164	2.476	43.6	0.021	0.021	0.310	0.046	0.402	5.6	0.8	0.277	4.9	0.7	
200,000 but under 500,000 kw. hours—															
Commercial.....	4.472	0.631	1.657	37.0	0.473	0.473	0.473	0.060	0.316	7.1	0.7	0.423	9.5	0.9	
Municipal.....	2.592	0.398	1.225	47.3	0.234	0.234	0.234	0.032	0.049	1.9	0.2	0.070	2.7	0.3	
500,000 but under 1,000,000 kw. hours—															
Commercial.....	2.697	0.333	0.921	34.2	0.241	0.241	0.241	0.042	0.156	5.8	0.6	0.258	9.6	1.0	
Municipal.....	1.777	0.256	0.764	43.0	0.115	0.115	0.115	0.030	0.022	1.2	0.1	0.141	7.9	0.9	
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	2.354	0.215	0.823	35.0	0.290	0.290	0.290	0.055	0.152	6.5	0.5	0.266	11.3	0.9	
Municipal.....	1.602	0.290	0.547	34.1	0.232	0.232	0.232	0.015	0.024	1.5	0.2	0.155	9.7	1.2	
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	1.751	0.088	0.476	27.2	0.195	0.195	0.195	0.026	0.123	7.0	0.6	0.228	13.0	1.0	
Municipal.....	1.067	0.318	0.382	35.8	0.100	0.100	0.100	0.011	0.011	7.0	0.6	0.228	13.0	1.0	
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	1.301	0.085	0.354	27.2	0.204	0.204	0.204	0.018	0.104	8.0	0.7	0.199	15.3	1.4	
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	0.843	0.047	0.181	21.5	0.012	0.012	0.153	0.006	0.074	8.8	0.7	0.078	9.2	0.7	
50,000,000 but under 100,000,000 kw. hours—															
Commercial.....	0.709	0.034	0.135	19.1	0.009	0.009	0.082	0.006	0.054	7.6	0.5	0.070	9.9	0.6	
100,000,000 but under 200,000,000 kw. hours—															
Commercial.....	0.555	0.038	0.124	22.4	0.034	0.034	0.055	0.005	0.064	11.5	0.6	0.029	5.3	3.3	
OIL-USING PLANTS: ⁵															
Under 200,000 kw. hours—															
Commercial.....	11.281	1.206	3.974	35.2	3.026	3.565	31.6	0.646	0.164	0.231	2.9	0.8	0.621	5.5	1.5
Municipal.....	11.609	1.207	4.370	37.6	3.209	3.895	33.6	0.309	0.113	0.002	0.002	0.002	0.183	1.6	0.4
200,000 but under 500,000 kw. hours—															
Commercial.....	6.774	0.797	1.621	23.9	1.480	1.798	26.6	0.404	0.105	0.270	4.0	0.8	0.893	13.2	2.7
Municipal.....	5.072	0.770	1.741	34.3	0.877	1.206	23.8	0.694	0.103	0.103	0.103	0.103	0.103	0.103	0.103
500,000 but under 1,000,000 kw. hours—															
Commercial.....	3.899	0.501	1.047	26.9	1.001	1.192	30.6	0.222	0.065	0.159	4.1	1.2	0.354	9.1	2.7
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	3.426	0.241	0.862	25.2	1.124	1.318	38.5	0.330	0.040	0.085	2.5	0.6	0.184	5.4	1.2
5,000,000 but under 10,000,000 kw. hours—															
Commercial.....	3.641	0.152	0.769	21.1	0.520	0.714	19.6	0.515	0.034	0.270	7.4	0.7	0.355	9.7	0.9
20,000,000 but under 50,000,000 kw. hours—															
Commercial.....	2.326	0.129	0.586	25.2	0.293	0.363	15.6	0.199	0.015	0.375	16.1	2.6	0.270	11.6	1.9
GAS-USING PLANTS:															
Under 200,000 kw. hours—															
Commercial.....	6.960	0.943	3.053	43.9	1.055	1.265	18.2	0.759	0.055	0.297	4.3	1.7	0.140	2.0	0.8
Municipal.....	5.695	1.233	2.048	36.0	0.855	1.010	17.7	0.254	0.026	0.026	0.026	0.026	0.468	8.2	2.6
200,000 but under 500,000 kw. hours—															
Commercial.....	5.564	0.569	1.887	33.9	0.689	0.912	16.4	0.551	0.096	0.347	6.2	1.5	0.312	5.6	1.4
Municipal.....	3.766	1.260	1.205	32.0	0.648	0.749	19.9	0.125	0.024	0.012	0.3	0.1	0.012	0.3	0.1
500,000 but under 1,000,000 kw. hours—															
Municipal.....	3.710	0.996	1.000	27.0	1.010	1.095	29.5	0.080	0.010	0.010	0.010	0.010	0.239	6.5	2.0
1,000,000 but under 2,000,000 kw. hours—															
Commercial.....	3.439	0.569	0.791	23.0	0.478	0.594	17.3	0.461	0.036	0.255	7.4	1.2	0.135	3.9	0.6
2,000,000 but under 5,000,000 kw. hours—															
Commercial.....	1.970	0.205	0.576	29.3	0.410	0.466	23.6	0.127	0.042	0.118	6.0	1.5	0.113	5.7	1.4

(See footnotes at end of table.)

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TABLE 96.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED GENERATING STATIONS, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS GENERATED AND THE TYPE OF PRIMARY POWER USED: 1917—Continued.

GROUP.	EXPENSES—continued.		DIVIDENDS.		VALUE OF PLANT AND EQUIPMENT.			EMPLOYEES.				FUEL—COAL.	
	Interest.		Per kw. hour sold.	Per cent of investment.	Per kw. hour sold.	Per kw. capacity of dynamos.	Total income—Per cent of investment.	Number per station.	Average compensation.	Kw. hours sold per employee.	Total income per employee.	Price per ton.	Pounds per kw. hour generated.
	Per kw. hour sold.	Per cent of total expenses.											
United States:	Cents.		Cents.		Cents.	Dollars.			Dollars.		Dollars.	Dollars.	(?)
Commercial.....	0.288	18.2	0.261	2.2	11.9	\$ 339	* 16.6	22.4	913	261,119	5,140	(?)	(?)
Municipal.....	0.237	7.9			12.4	* 180	* 31.6	4.7	807	94,775	3,706		
STEAM (COAL-USING) PLANTS:¹													
Under 200,000 kw. hours—													
Commercial.....	0.489	4.9	0.250	0.8	31.5	179	33.2	3.1	713	21,712	2,265	3.40	18.26
Municipal.....	0.585	6.5			25.4	170	39.2	2.5	750	26,636	2,649	* 3.78	¹⁰ 17.51
200,000 but under 500,000 kw. hours—													
Commercial.....	0.617	8.3	0.230	0.9	26.2	236	29.9	6.3	879	40,912	3,203	3.87	11.88
Municipal.....	0.284	4.9			15.4	156	46.4	5.2	797	50,738	3,628	3.74	12.45
500,000 but under 1,000,000 kw. hours—													
Commercial.....	0.462	9.0	0.397	1.4	28.8	308	19.5	9.5	830	58,893	3,316	* 3.39	8.71
Municipal.....	0.181	4.0			12.2	158	44.8	8.1	878	66,324	3,633	3.68	8.94
1,000,000 but under 2,000,000 kw. hours—													
Commercial.....	0.564	11.5	0.508	2.0	25.1	312	22.7	16.3	843	65,426	3,734	3.59	7.32
Municipal.....	0.192	5.0			11.9	154	45.9	13.0	904	79,814	4,348	¹¹ 4.24	¹² 5.90
2,000,000 but under 5,000,000 kw. hours—													
Commercial.....	0.427	12.1	0.369	2.3	16.0	244	25.5	24.8	883	105,889	4,322	3.57	5.78
Municipal.....	0.057	2.3			8.2	144	40.7	20.8	882	140,192	4,697	3.06	5.82
5,000,000 but under 10,000,000 kw. hours—													
Commercial.....	0.430	12.5	0.343	1.9	18.0	247	21.5	51.1	890	111,673	4,329	¹³ 4.16	¹⁴ 4.35
Municipal.....	0.166	6.4			9.3	136	34.9	44.2	951	141,718	4,619	4.08	3.84
10,000,000 but under 20,000,000 kw. hours—													
Commercial.....	0.312	14.4	0.329	2.2	14.8	268	18.0	59.1	880	182,877	4,858	¹⁵ 4.16	¹⁶ 2.95
20,000,000 but under 50,000,000 kw. hours—													
Commercial.....	0.284	13.1	0.357	2.5	14.5	261	17.9	126.9	898	184,622	4,789	3.61	3.34
50,000,000 but under 100,000,000 kw. hours—													
Commercial.....	0.298	15.2	0.384	3.1	12.3	259	19.8	302.8	919	207,687	5,071	3.25	3.32
100,000,000 but under 200,000,000 kw. hours—													
Commercial.....	0.201	14.5	0.301	3.1	9.9	246	17.0	315.0	1,053	306,289	6,157	3.60	2.55
200,000,000 kw. hours and over—													
Commercial.....	0.223	11.0	0.420	3.8	11.0	293	23.6	2,446.5	1,002	202,755	5,254	3.71	¹⁶ 2.49
WATER-POWER PLANTS:													
Under 200,000 kw. hours—													
Commercial.....	1.042	14.5	0.195	0.4	52.8	259	15.7	2.7	713	22,861	1,891		
Municipal.....	1.387	24.4			41.1	254	19.4	2.1	664	26,839	2,141		
200,000 but under 500,000 kw. hours—													
Commercial.....	0.891	19.9	0.430	1.0	44.9	347	12.0	5.2	759	45,771	2,464		
Municipal.....	0.582	22.4			22.4	237	18.7	5.0	696	56,778	2,382		
500,000 but under 1,000,000 kw. hours—													
Commercial.....	0.745	27.6	0.473	1.8	26.8	334	13.3	6.4	853	92,632	3,306		
Municipal.....	0.447	25.2			16.1	181	16.5	6.0	810	106,099	2,828		
1,000,000 but under 2,000,000 kw. hours—													
Commercial.....	0.533	22.6	0.392	1.3	29.2	330	10.7	10.2	968	117,563	3,682		
Municipal.....	0.340	21.2			13.4	146	19.4	6.5	847	154,917	4,032		
2,000,000 but under 5,000,000 kw. hours—													
Commercial.....	0.564	32.2	0.164	0.7	22.1	320	9.0	13.8	900	188,939	3,768		
Municipal.....	0.256	24.0			6.2	222	2.3	13.5	733	191,955	3,853		
5,000,000 but under 10,000,000 kw. hours—													
Commercial.....	0.335	25.7	0.237	1.6	14.5	279	11.8	23.5	878	247,608	4,257		
20,000,000 but under 50,000,000 kw. hours—													
Commercial.....	0.293	34.7	0.079	0.8	10.4	337	10.6	57.5	1,092	602,957	6,635		
50,000,000 but under 100,000,000 kw. hours—													
Commercial.....	0.318	44.9	0.110	1.0	11.5	365	7.2	77.4	1,080	797,572	6,591		
100,000,000 but under 200,000,000 kw. hours—													
Commercial.....	0.207	37.3	0.063	0.6	11.4	393	6.8	166.8	928	745,842	5,777		
FUEL—OIL.													
												Price per barrel.	Gallons per kw. hour generated. ¹⁷
OIL-USING PLANTS:¹⁸													
Under 200,000 kw. hours—												Dollars.	
Commercial.....	0.772	6.8	0.130	0.3	41.5	269	28.4	1.9	641	16,137	1,899	3.49	0.43
Municipal.....	1.530	13.2			41.5	253	29.2	1.5	708	16,190	1,964	4.02	0.40
200,000 but under 500,000 kw. hours—													
Commercial.....	0.886	13.1			33.6	323	23.6	4.0	934	57,616	4,567	1.52	0.49
Municipal.....	0.558	11.0			31.2	274	22.9	5.2	810	46,538	3,328	(¹⁹)	(¹⁹)
500,000 but under 1,000,000 kw. hours—													
Commercial.....	0.759	9.2	0.530	4.0	13.3	250	33.9	5.8	1,009	96,378	4,334	1.74	0.29
2,000,000 but under 5,000,000 kw. hours—													
Commercial.....	0.366	10.7	0.119	0.8	15.2	242	32.1	29.0	813	94,247	4,591	1.01	0.55
5,000,000 but under 10,000,000 kw. hours—													
Commercial.....	0.83	22.9	0.944	2.3	41.5	673	11.7	46.3	866	112,590	5,472	0.82	0.32
20,000,000 but under 50,000,000 kw. hours—													
Commercial.....	0.589	16.7	0.206	1.5	14.2	297	22.5	168.0	1,003	171,140	5,470	0.77	0.19

(See footnotes at end of table.)

TABLE 96.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED GENERATING STATIONS, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS GENERATED AND THE TYPE OF PRIMARY POWER USED: 1917—Continued.

GROUP.	EXPENSES—continued.		DIVIDENDS.		VALUE OF PLANT AND EQUIPMENT.			EMPLOYEES.				FUEL—GAS.		
	Interest.		Per kw. hour sold.	Per cent of investment.	Per kw. hour sold.	Per kw. capacity of dynamos.	Total income—Per cent of investment.	Number per station.	Average compensation.	Kw. hours sold per employee.	Total income per employee.	Price per 1,000 cu. ft.	Cu. ft. per kw. hour generated.	
	Per kw. hour sold.	Per cent of total expenses.												
GAS-USING PLANTS:														
Under 200,000 kw. hours—	<i>Cents.</i>		<i>Cents.</i>		<i>Cents.</i>		<i>Dollars.</i>		<i>Dollars.</i>		<i>Dollars.</i>	<i>Cents.</i>		
Commercial.....	0.448	6.4	0.068	0.4	17.2	120	44.2	3.2	804	26,321	1,999	16.3	64.8	
Municipal.....	0.655	11.5			17.8	124	38.0	1.6	715	34,904	2,362	14.5	59.2	
200,000 but under 500,000 kw. hours—														
Commercial.....	0.890	18.0	0.316	1.4	22.8	198	28.6	6.3	787	41,686	2,717	15.2	45.5	
Municipal.....	0.392	10.4			12.6	185	45.8	4.5	842	69,895	4,041	11.5	56.1	
500,000 but under 1,000,000 kw. hours—														
Municipal.....	0.290	7.8			11.8	158	45.3	7.0	814	81,299	4,361	30.6	33.0	
1,000,000 but under 2,000,000 kw. hours—														
Commercial.....	0.597	17.4	0.120	0.6	21.0	109	19.1	10.0	895	113,173	4,543	11.7	41.0	
2,000,000 but under 5,000,000 kw. hours—														
Commercial.....	0.322	16.4	0.060	0.6	7.9	91	33.2	17.0	825	143,131	3,757	33.2	12.3	

¹ Estimated value of free service included.

² Includes only those stations which generated all or part of current.

³ Exclusive of all single municipal stations, including 1 of the group "10,000,000 but under 20,000,000 kw. hours," 1 of the group "20,000,000 but under 50,000,000 kw. hours," and of the group "50,000,000 but under 100,000,000 kw. hours."

⁴ Exclusive of 1 commercial station of the group "10,000,000 but under 20,000,000 kw. hours," and 2 of the group "20,000,000 kw. hours, and over," to avoid disclosure of individual operations; and all single municipal stations, including 1 of the group "5,000,000 but under 10,000,000 kw. hours," and 1 of the group "10,000,000 but under 20,000,000 kw. hours."

⁵ Exclusive of 2 commercial stations of the group "1,000,000 but under 2,000,000 kw. hours," 1 of the group "10,000,000 but under 20,000,000 kw. hours," and 1 of the group "50,000,000 but under 100,000,000 kw. hours," to avoid disclosure of individual operations; and all single municipal stations, including 1 of the group "500,000 but under 1,000,000 kw. hours," 1 of the group "1,000,000 but under 2,000,000 kw. hours," 1 of the group "2,000,000 but under 5,000,000 kw. hours," 1 of the group "5,000,000 but under 10,000,000 kw. hours," and 1 of the group "10,000,000 but under 20,000,000 kw. hours."

⁶ Estimated on the basis of the percentage of dynamo not driven by water power.

⁷ Unknown.

⁸ Less than one-tenth of 1 per cent.

⁹ Includes the price of a relatively small amount of gas.

¹⁰ This group also used 2 cubic feet of gas per kw. hour.

¹¹ Includes the price of a considerable quantity of gas.

¹² This group also used 8.7 cubic feet of gas per kw. hour.

¹³ This group also used 1.6 cubic feet of gas per kw. hour.

¹⁴ Includes the price of some gas.

¹⁵ This group also used 2.5 cubic feet of gas per kw. hour.

¹⁶ A relatively negligible quantity of gas was also used.

¹⁷ Computed on basis of 50 gallons per barrel.

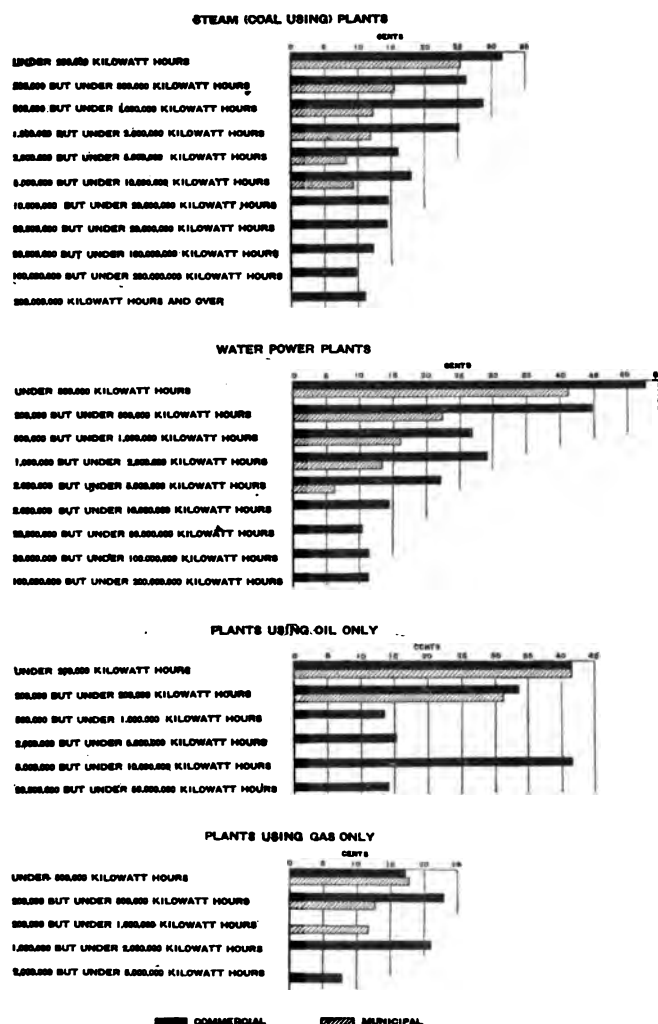
¹⁸ Accurate figures not available.

So far as the investment per kilowatt capacity of dynamo is concerned, no more need be said, as data for this item have been presented in connection with Table 95. It may, however, be interesting to call attention to the amount of investment per kilowatt hour sold (Table 96). Here again we find that in most cases each kilowatt hour sold requires a fewer number of cents investment for municipal than for commercial stations. For each type of plant there is little difference in the lowest group, particularly for the oil and gas plants. In other groups, however, the difference is marked. As the size of plant increases there is to be found a constant decrease in the number of cents invested per kilowatt hour sold for both steam and water-power plants. In other types of plants the tendency is not clear.

A further analysis can be made of the per cent which the total income forms of the value of plant and equipment in these classified plants. Again, it appears

that in most cases the income bears a higher ratio to the value for municipal than for commercial plants. All plants considered, however, there does not appear to be any close relation between the size of station and the percentage relation of income and investment so far as the low groups are concerned. As the groups of commercial plants grow larger it is found that the investment grows increasingly higher in relation to the total income. This is particularly true of water-power plants, in which the ratio of income to investment decreases from 15.7 per cent in the lowest group to 6.8 per cent in the highest; in other words, the total income of the largest hydroelectric plants is a little more than one-sixteenth the investment. Hence, with the heavy fixed charges which must be incurred, a slight decrease in income may mean the financial ruin of such a plant. The significance of this condition will become increasingly evident as other figures in the table are studied.

DIAGRAM 17.—INVESTMENT IN PLANT AND EQUIPMENT PER KILOWATT HOUR SOLD, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917 (CENTS).



Expenses per kilowatt hour sold.—The total expenses per kilowatt hour sold, as shown in Table 96, while only about one-half as high (1.581 cents) for all commercial plants in the United States as for all municipal plants (3.001 cents), are usually somewhat lower in the groups of municipal stations included in Table 96 than for the corresponding commercial stations. For commercial steam plants, however, there is a constant and marked decrease in cost per kilowatt hour, as plants increase in size, from 10.080 cents in the lowest group to 1.387 cents in next to the highest group. Commercial water-power plants show a cost which decreases from 7.168 cents in the lowest group to little more than one-half of 1 cent in the highest group. Similar conditions are to be found in the case of the few oil and gas using plants reported.

Some attention should perhaps be given to the various items which enter into the expenses of operation. It should first be mentioned in passing that the questionable sinking-fund charges have been omitted from this tabulation. The items of expense of most interest for comparative purposes are supplies and materials, salaries and wages, fuel, taxes, deprecia-

tion, and interest. Other items, with the exception of insurance, have been grouped under the head of "Miscellaneous."

The expenditure for supplies and materials, not including fuel and wages, is difficult to reduce to any standard. For all municipal plants in the United States, however, the amount paid under this head per kilowatt hour sold is four-tenths of 1 cent, while the corresponding payment by commercial plants is only nine one-hundredths of 1 cent. Consequently it is not surprising to find that in every group of coal-using stations municipal plants report a higher unit expenditure for this purpose than do commercial stations.

There appears to be no necessary connection between the price per ton paid for coal and the size of stations. It is, of course, possible that the larger stations are securing a better quality of coal for their money, and it is further true that many of the small coal-using plants are situated in districts where coal is very cheap. Nor does it appear that there is any marked difference between the price paid by municipal and by commercial plants. In three cases the rates are higher for municipal stations, in two cases they are somewhat lower, and in one case noticeably lower. Further, there seems to be little difference between the two groups so far as concerns the number of pounds of coal used per kilowatt hour generated. The interesting fact, however, is the uninterrupted decrease in the number of pounds of coal required as commercial plants increased in size, the highest group requiring only 2.49 pounds per kilowatt hour, while the lowest uses 18.26 pounds.

DIAGRAM 18.—PER CENT WHICH TOTAL INCOME FORMS OF INVESTMENT IN COMMERCIAL AND MUNICIPAL STEAM AND WATER POWER PLANTS: 1917.

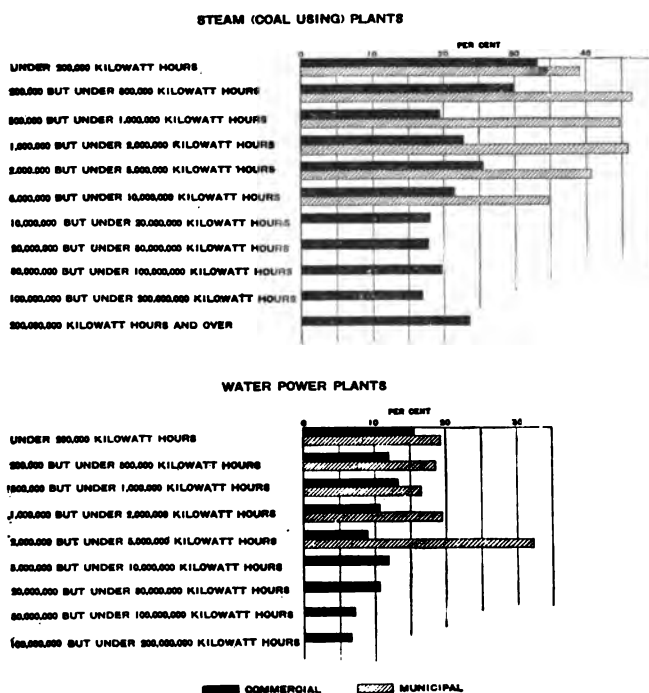
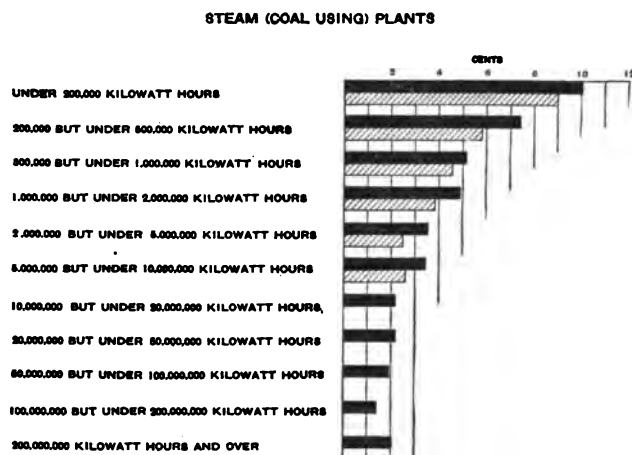
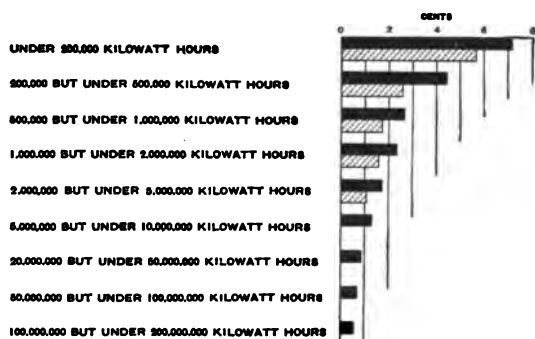


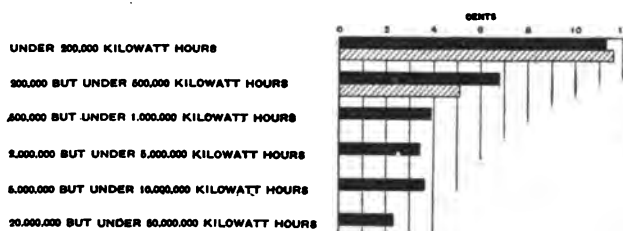
DIAGRAM 19.—TOTAL EXPENSES PER KILOWATT HOUR SOLD, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917 (CENTS).



WATER POWER PLANTS



PLANTS USING OIL ONLY



PLANTS USING GAS ONLY



COMMERCIAL MUNICIPAL

DIAGRAM 20.—NUMBER OF POUNDS OF COAL USED PER KILOWATT HOUR GENERATED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917.

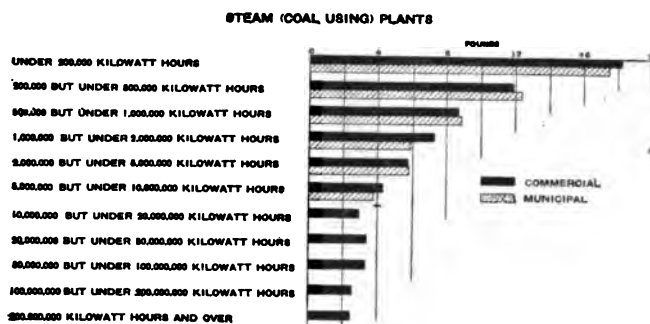
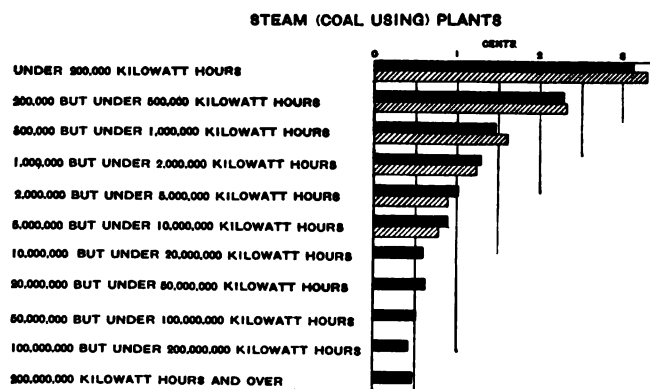
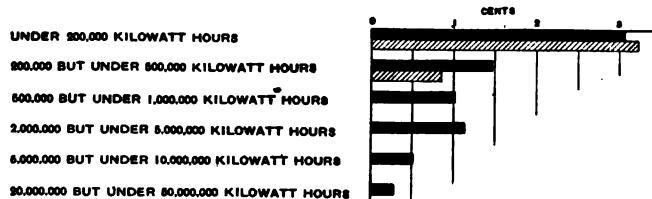


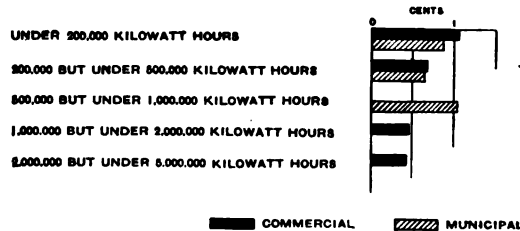
DIAGRAM 21.—COST OF FUEL PER KILOWATT HOUR GENERATED, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917 (CENTS).



PLANTS USING OIL ONLY



PLANTS USING GAS ONLY



COMMERCIAL MUNICIPAL

Except in the lowest group of oil-using plants, which is a numerous one, it is not possible to make comparisons between municipal and commercial stations. In this group, however, we find that the former pay considerably more per barrel for their oil than do the latter (\$4.02 as opposed to \$3.49). The quantity of oil consumed per kilowatt hour generated is about the same in either group. As the stations grow larger the price paid for oil decreases rapidly, as well as the quantity of oil which is required per kilowatt hour generated. However, on account of the small number of plants involved, it is not safe to make any positive deductions from the figures given.

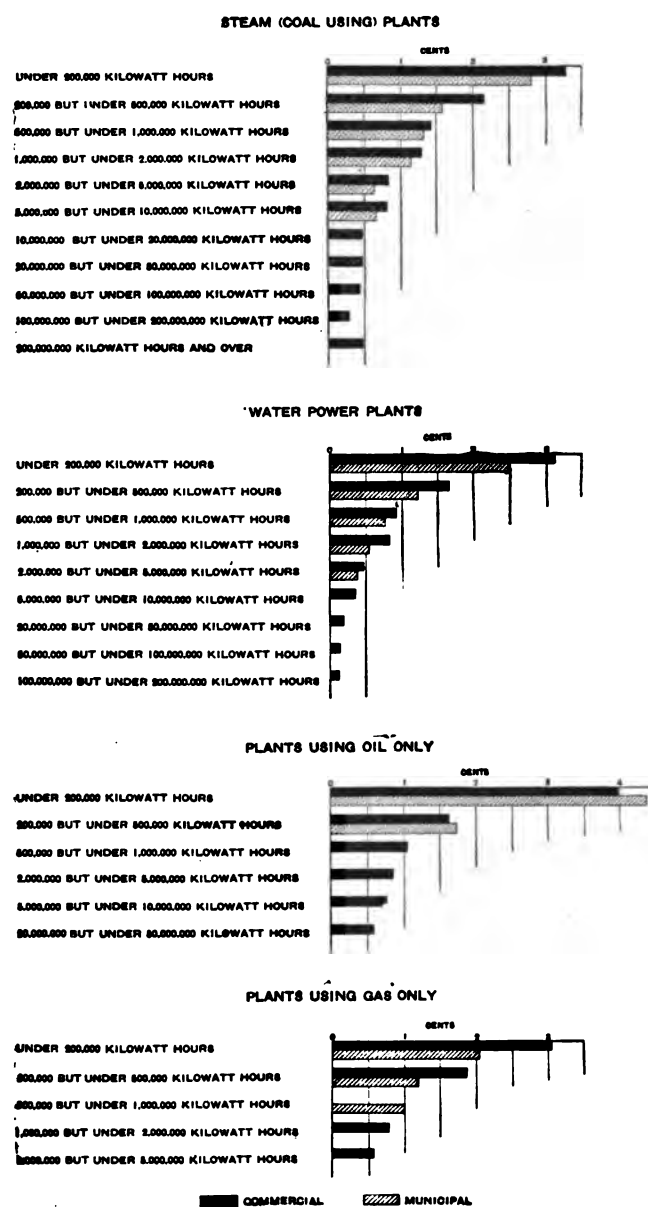
In most groups of steam plants under the two classes of ownership the unit costs of coal are close together, but the percentage which the cost of fuel forms of the total outlays is always lower for commercial stations. For the oil plants in the group generating less than 200,000 kilowatt hours we find a somewhat higher rate paid for fuel per kilowatt hour sold by municipal plants. It should be noted, however, that there is a continuous decrease in the cost of coal per kilowatt hour generated as the output of electric stations is increased. While commercial stations generating under 200,000 kilowatt hours spend 3.103 cents per kilowatt for this purpose, the group generating over 200,000,000 kilowatt hours spends less than one-half of 1 cent for coal. The decrease in unit expenditure under this head, however, is not so marked after we have passed the group generating "10,000,000 but under 20,000,000 kilowatt hours."

What has been said regarding the decrease in the cost of fuel per kilowatt hour generated and sold is in the main true of the outlays for salaries and wages, which rank next in importance after fuel in the total expenses. This expense is naturally lower per kilowatt hour sold for water-power plants than for steam plants. It should, however, be observed that this expense is in nearly all cases higher per kilowatt hour sold for commercial than for municipal plants—a condition which is the result of several causes. First, municipal plants do not have salaried officers of corporations; secondly, somewhat lower wages are paid by municipal plants to their employees in general; and, third, many municipal plants secure part-time service from the employees of other public departments under circumstances which would make it necessary for a commercial plant to hire a full-time employee.

While miscellaneous expenses per kilowatt hour sold are higher for all municipal stations in the United States than for all commercial stations, they appear to be lower in practically every case for the municipal plants shown in Table 96. These so-called miscellaneous expenses include "electric current

purchased," "rent of offices, stations, line-wire supports, conduits, etc.," "injuries and damages," and all other expenses incident to operation and maintenance which are not listed under the general heads given. It is also significant to find that the unit expenditure by municipal plants for insurance, while naturally a small item, is in nearly every instance much lower relatively than for commercial plants. In many cases this expense, if incurred, is taken care of by the general municipal budget.

DIAGRAM 22.—SALARIES AND WAGES PER KILOWATT HOUR SOLD, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917 (CENTS).



Some taxes are paid by municipal plants, but, as indicated by the figures presented in Table 96, this charge is relatively negligible. For commercial sta-

tions it is apparent that the amount of taxes paid per kilowatt hour sold decreases as the plant increases in size, though there is little difference in the per cent which taxes form of the value of plant and equipment. The significant fact, however, is that, particularly in the case of coal-using and water-power plants, the relative importance of taxes in the total expenses continuously increased from the smallest to the largest plants. For coal-using plants this item constituted only 3 per cent of all expenses in the first group and 10 per cent in the group generating over 200,000,000 kilowatt hours.

DIAGRAM 23.—TAXES—PER CENT OF TOTAL EXPENSES IN COMMERCIAL COAL-USING AND WATER-POWER PLANTS: 1917.

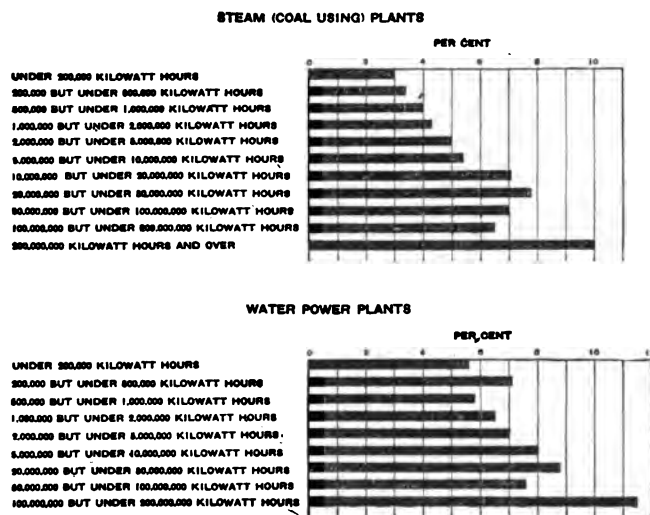


DIAGRAM 24.—DEPRECIATION PER KILOWATT HOUR SOLD, FOR COMMERCIAL AND MUNICIPAL STEAM AND WATER POWER PLANTS: 1917 (CENTS).

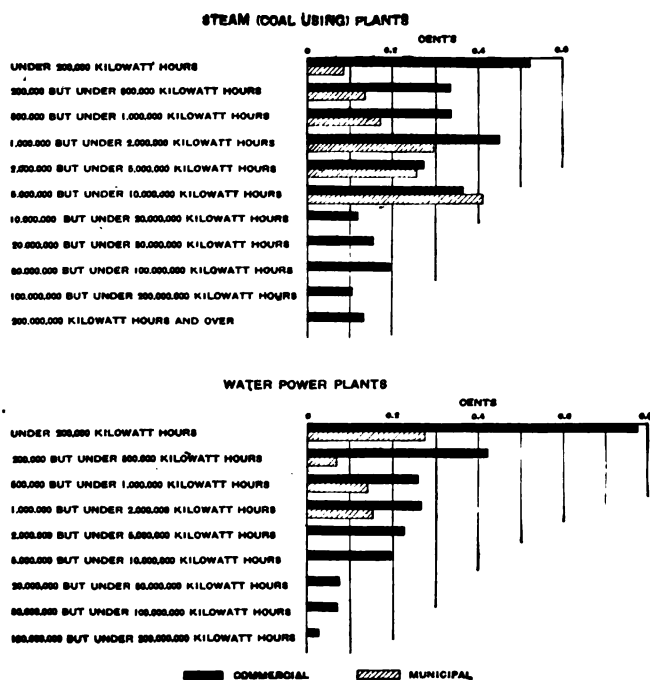
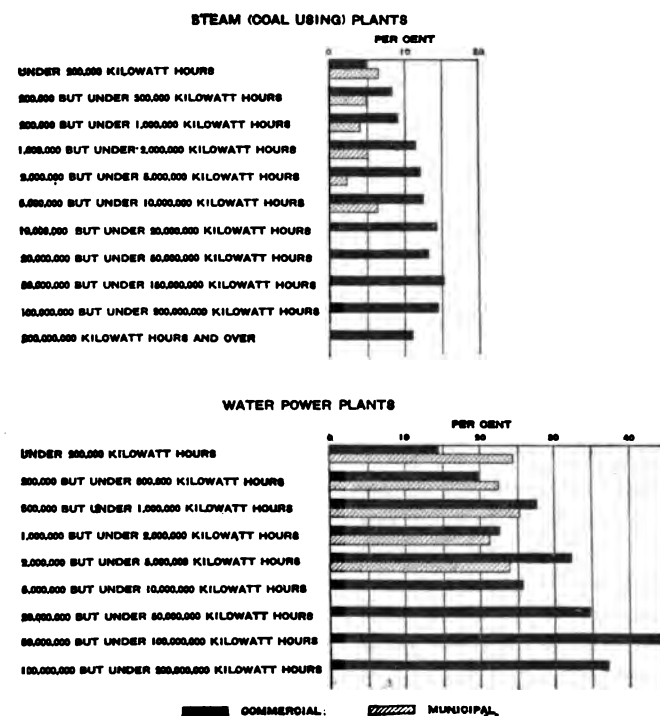


DIAGRAM 25.—PER CENT OF TOTAL EXPENSES PAID IN INTEREST BY COMMERCIAL AND MUNICIPAL PLANTS: 1917.

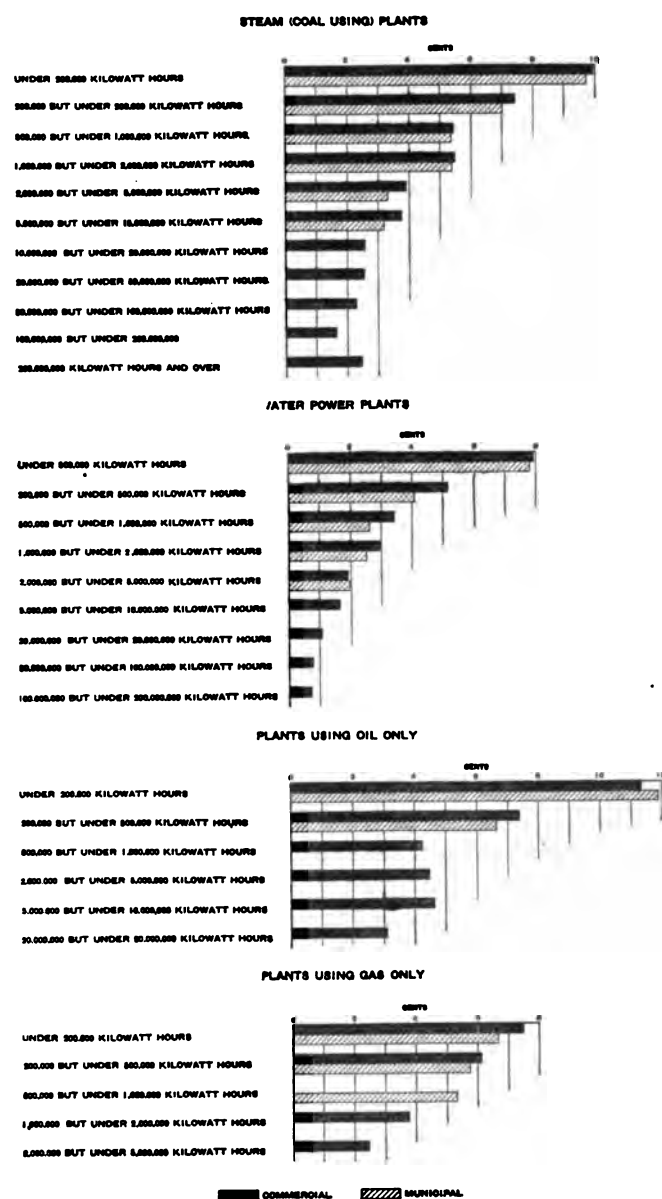


The amount expended for depreciation by municipal plants in the United States appears to be higher per kilowatt hour sold (about two-tenths of 1 cent) than that expended by commercial plants (one-tenth of 1 cent). The ratio of this expense to value of plant and equipment is also higher for the average municipal plant in the United States. However, upon examining the different groups of plants in Table 96, it appears that in most cases commercial plants are expending far more per kilowatt hour sold for depreciation than are municipal plants. Usually, also, this expense forms a larger proportion of the total for commercial than for municipal plants. The amount expended per kilowatt hour sold tends to grow less as plants increase in size, but the proportion which this charge forms of the total, as well as the percentage relation to the investment, does not appear to have any connection with the size of plant.

The last important item of expense is interest payments. It is found that in most cases commercial plants pay far more per kilowatt hour sold for interest than do municipal plants, and, further, that as a rule the percentage of the total expenses incurred under this head is also much higher for this group. Again, so far as commercial plants are concerned, there is a clearly marked tendency for the importance of this item to increase with the increase in the size of plant. Most significant, however, are the comparative figures, which show the relative importance of this item for commercial steam plants and commercial water-power plants. While in the case

of the former interest amounted to only 4.9 per cent of all expenses in the lowest group, in the corresponding group of water-power plants this charge amounted to 14.5 per cent. In the larger groups of coal-using plants the highest interest charge was only 15.2 per cent of the total expenses, whereas for the corresponding groups of water-power plants it amounted to 44.9 per cent of the total expenses. From these figures it is possible to draw a very definite conclusion regarding the need of sure guaranties for investment in hydroelectric stations and the significance of lower interest rates if there is to be a further development of our hydroelectric resources.

DIAGRAM 26.—TOTAL INCOME FROM SALE OF CURRENT, PER KILOWATT HOUR SOLD, IN COMMERCIAL AND MUNICIPAL STATIONS: 1917 (CENTS).



Perhaps attention should again be called specifically in this connection to some of those expenses incurred by commercial plants which are not incurred by

municipal plants and which in most cases fully account for the difference existing between the unit costs for current sold. The most important item, of course, is taxes. To this should be added the higher charge for depreciation per kilowatt hour sold in these selected plants, as well as that portion of miscellaneous expenses which is due to advertising, display rooms, etc., together with that portion of salaries and wages which goes to salaried officers of corporations. When these deductions are made from the entire expenses, the first two of which are perfectly clear, it will be found that in most cases the unit costs are fully as low for commercial plants as for municipal, and frequently considerably lower. If an additional allowance were also made for the higher unit expenditure for interest paid by commercial plants, there is no question that most groups of commercial plants would be operating at a much lower cost per kilowatt hour than the corresponding municipal plants.

Income per kilowatt hour sold.—The differences in income per kilowatt hour sold by commercial and municipal plants are in most cases not so marked as the differences in the various operating expenses. It must be noted, however, that while there is usually very little difference in the average number of cents received per kilowatt hour sold for *all* purposes, it frequently happens in some of the higher groups that municipal plants charge considerably less for light than do commercial plants. The apparent advantage which the customers of municipal stations seem to have in this regard may, however, be misleading, for, as the schedules show, an unusually large percentage of the current supplied for light by the various groups of municipal plants is used for street lighting. The value of this service is usually merely estimated, frequently at a very low rate, and in all events the normal charge for street lighting is much lower than that for domestic lighting. Therefore, when the estimated value of street lighting is included with the income received from customers in general and the total is divided by the number of kilowatt hours reported as supplied for lighting purposes of all kinds, the resultant figure indicates an average lighting rate which is lower than actually exists. As the data are now collected, it is impossible to compare lighting rates except in a very general way.

In view of the fact that power rates for all plants are much lower for commercial than for municipal stations, it is somewhat surprising to find that in this particular selection of plants the average charge per kilowatt hour sold is about the same in most of the lowest groups. In several instances the rate appears to be even lower for municipal stations. But in many of these cases, it should be explained, a considerable part of the power used is supplied at an abnormally low rate for municipal uses. Customers in general are not so highly favored.

DIAGRAM 27.—INCOME FROM SALE OF CURRENT FOR POWER, PER KILOWATT HOUR SOLD, IN COMMERCIAL AND MUNICIPAL STEAM AND WATER POWER PLANTS: 1917 (CENTS).

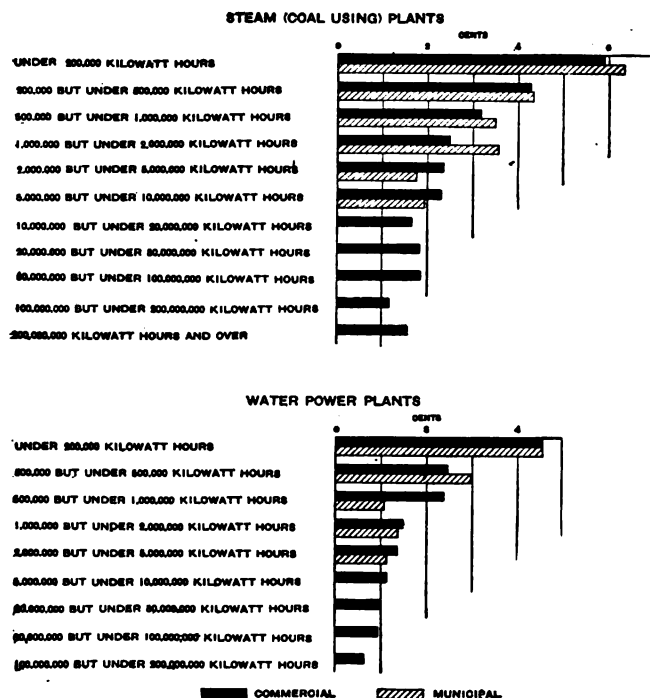
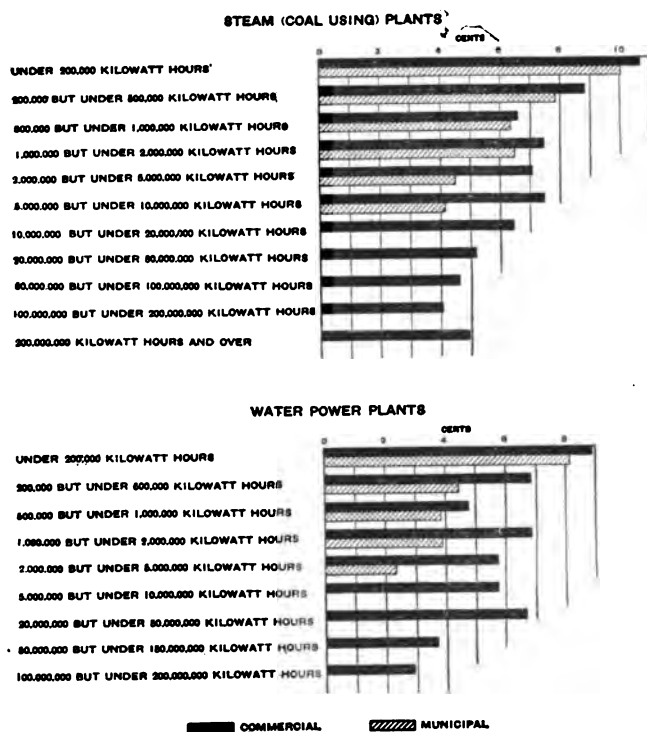


DIAGRAM 28.—INCOME FROM SALE OF CURRENT FOR LIGHT, PER KILOWATT HOUR SOLD, IN COMMERCIAL AND MUNICIPAL STEAM AND WATER POWER PLANTS: 1917 (CENTS).



So little current is sold by municipal plants to other companies, and so small an amount as well by the corresponding commercial plants, that no significant

comparisons can be made. In general, rates charged for this service by the small commercial stations are somewhat higher than the rates charged by municipal plants. But, of course, the local situation is not known.

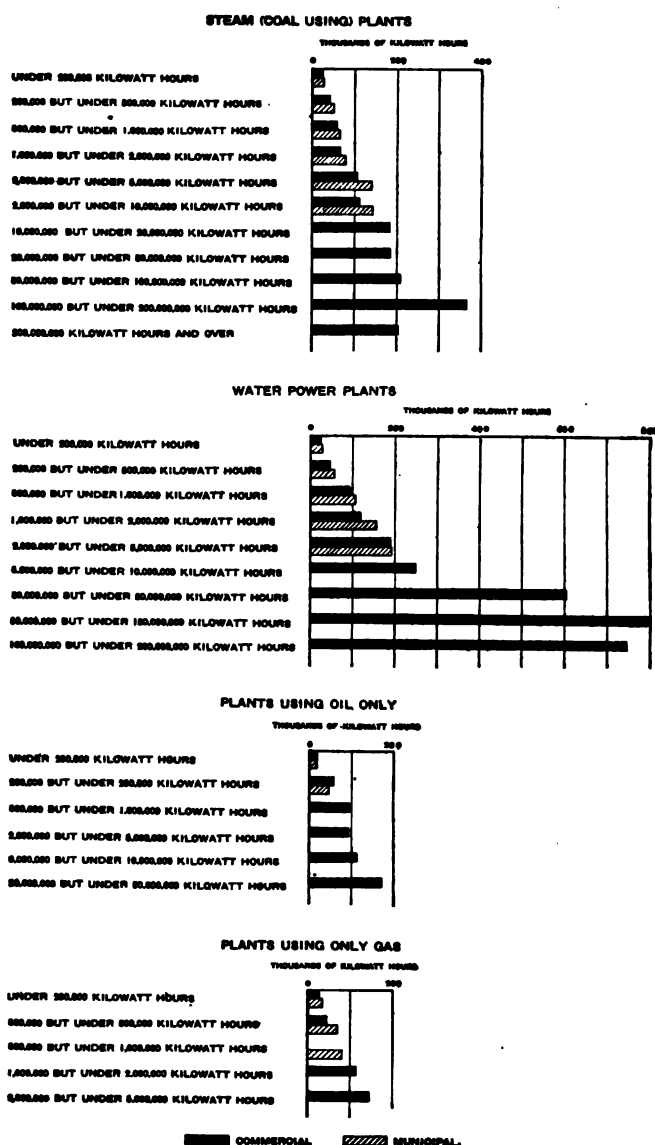
The average rates charged by oil-using plants are somewhat higher than those charged by steam plants and much in excess of the rates found in water-power plants.

In all classes there is a general tendency toward lower rates as the size of plant increases. This is particularly true of power rates, which for steam plants decrease from 5.903 cents in the lowest group to 1.163 cents in next to the highest group. An even more marked decrease is found in the case of water-power plants, which frequently sell a large proportion of their current to other companies and do a relatively small amount of lighting. On the other hand, after the first two groups are passed, there does not seem to be a very close connection between the average rates charged for lighting and the size of plants, except in the case of municipal stations, in which the rates appear to decrease. The net income per kilowatt hour sold, according to the figures here tabulated, is usually higher for municipal than for commercial plants. If, however, the former were subject to many of the additional charges necessarily incurred by the latter, this difference would no longer exist.

Employees.—Brief reference should be made to the labor efficiency of the various sizes and groups of stations in Table 96. The average number of employees is usually slightly lower for municipal than for commercial stations, due in the main to reasons which have already been suggested. As a result of this lower figure the average number of kilowatt hours sold per employee is normally somewhat higher for municipal stations. This means that in many cases the average income per employee is also higher, though for the entire United States both the output and the income are much higher in the case of commercial stations. As plants increase in size there is in almost every instance a corresponding increase in the number of kilowatt hours sold per employee, but in the case of coal-using plants this increase is not marked after the group generating "10,000,000 but under 20,000,000 kilowatt hours" has been reached. It is further significant that water-power plants, after the first two groups are passed, report a much higher number of kilowatt hours sold per employee than do any of the other classes of plants. Finally, there does not appear to be any particular connection between the average compensation paid to all employees and the size of plant, with the following exceptions: In the lowest group of coal-using plants and in the two lowest groups of water-power plants the average wage is lower than is normal in municipal stations,

due, no doubt, to the fact that some of the workers reported are employed for only part of the time. In some of the highest groups of commercial plants, also, the average is found to be a little above the normal, probably because of the high compensation of salaried officers in these groups. Municipal coal-using plants in some cases appear to pay higher wages than do commercial plants. For the water-power plants, however, commercial stations always lead by a wide margin.

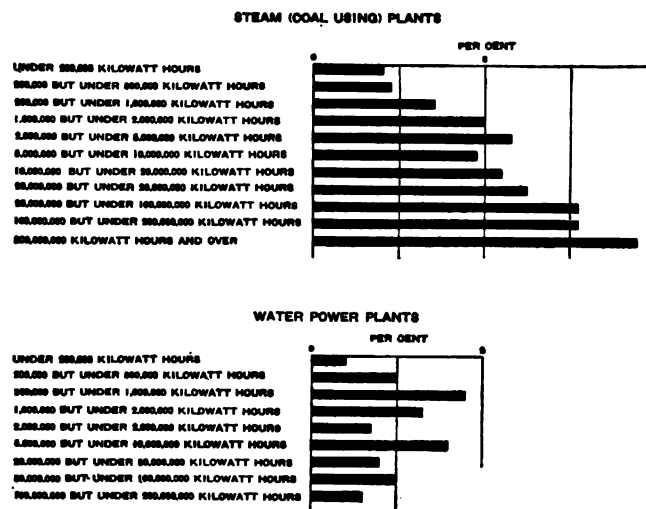
DIAGRAM 29.—KILOWATT HOURS SOLD PER EMPLOYEE, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917.



Dividends.—The amount paid in dividends per kilowatt hour sold bears no direct relation to the size of

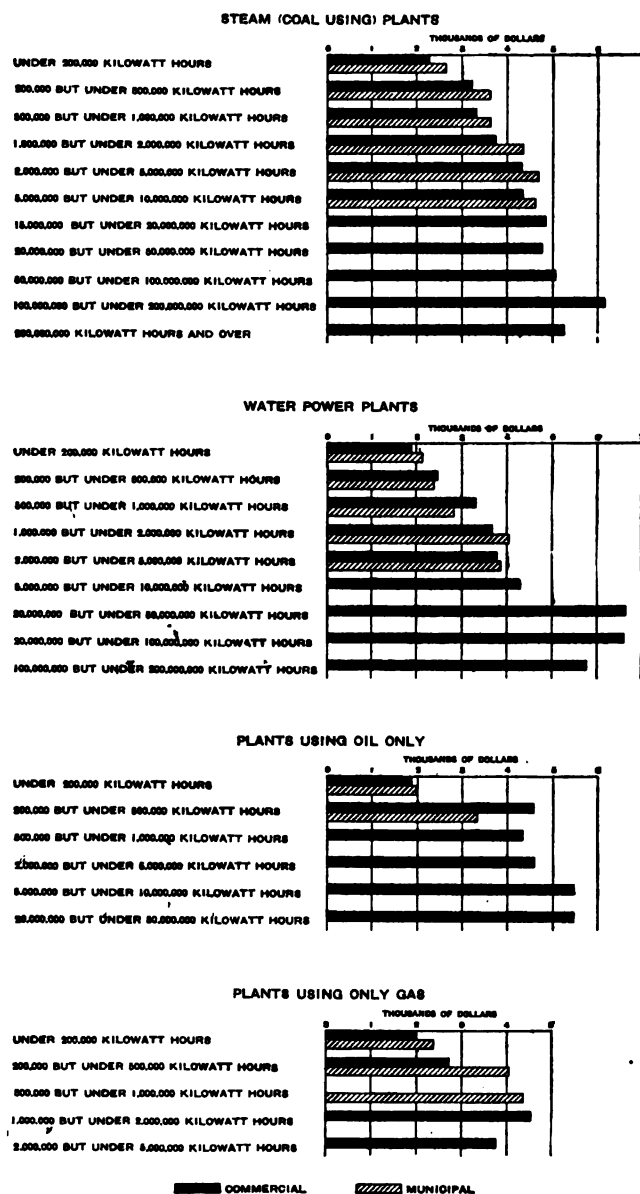
station, though for hydroelectric plants it appears to grow less as the stations become larger. In the case of coal-using plants the ratio which dividends bear to the value of plant and equipment is lowest in the first two groups, under 1 per cent. From this point, however, there is a constant upward tendency until the highest group is reached, when we find a rate of 3.8 per cent. Water-power plants, on the contrary, indicate no such tendency. Not only is the rate of dividend to total value lower for practically every group than for coal-using plants, but the general tendency seems to be toward a decreased rate as the size of plant increases. The highest rates paid are found in the group generating "500,000 but under 1,000,000 kilowatt hours" (1.8 per cent) and in the group generating "5,000,000 but under 10,000,000 kilowatt hours" (1.6 per cent). The highest groups pay a rate ranging from six-tenths of 1 per cent to 1 per cent. It does not, therefore, appear that at present hydroelectric stations are a particularly profitable investment.

DIAGRAM 30.—DIVIDENDS—PER CENT ON INVESTMENT FOR COMMERCIAL STEAM AND WATER POWER PLANTS: 1917.



Economies of large-scale production.—From the analyses which have already been made it is possible for the reader to deduce his own conclusions regarding the economies of large-scale production in the central electric light and power industry. The subject has been so presented in Table 96 and the accompanying diagrams that the conditions should be fairly obvious. A few remarks, however, may be in order regarding the facts indicated by the statistics of commercial plants, which alone furnish examples of real large-scale production.

DIAGRAM 81.—AVERAGE INCOME PER EMPLOYEE, BY KIND OF PRIMARY POWER USED, FOR COMMERCIAL AND MUNICIPAL STATIONS: 1917.



So far as coal-using plants are concerned, we find a rapid decrease in most items of expense until the group is reached which generates "10,000,000 but under 20,000,000 kilowatt hours." After this point the tendency toward decreasing costs is by no means clearly marked, though it is most obvious in the case of fuel costs. In the groups of plants which are sufficiently large to be typical, however, the unit expense for salaries and wages does not show any appreciable decrease, nor is there much change in the items "supplies and materials," "insurance," "taxes," "depreciation," etc. It is further evident that, beginning with the group "10,000,000 but under 20,000,000 kilowatt hours" the value of plant and

equipment per kilowatt capacity of dynamos remains fairly stationary, as well as the ratio of total income to total investment. The same facts appear in connection with the number of kilowatt hours sold per employee and the total income per employee.

In the highest group of coal-using plants, which generate "200,000,000 kilowatt hours and over," nearly all unit expenses mount rapidly. These are the plants which distribute current in very large cities, or, being located in a somewhat smaller place, furnish current to a large number of different municipalities. Tentatively, therefore, it would appear that conditions which such establishments have to meet are of such a nature that their increased economic efficiency over the moderate-sized plant is open to serious question. In the case of water-power plants it is also apparent that after the group which generates "20,000,000 but under 50,000,000 kilowatt hours" is reached the decrease in operating costs as the size of plant grows is not particularly marked. This, of course, may be due to the fact that current generated in these large hydroelectric stations is sent over increasingly long distances to the ultimate consumers.

Comparative statistics of plants purchasing all current.—After the analyses which have been made of the statistics of the selected group of generating plants, little need be said regarding the figures for plants which purchase all of their current. These were selected in the same manner as the others, all composite plants, unincorporated plants, plants doing only street lighting, and plants doing no commercial lighting being omitted from the tabulations. There are included, however, 571 commercial and 373 municipal stations, or 65.1 per cent and 68.9 per cent of the total number of purchasing plants reported under the respective forms of ownership. These also have been grouped according to the number of kilowatt hours purchased.

Upon comparing the expenses per kilowatt hour sold in the two groups of plants it appears that, in general, commercial stations are operating at a slightly lower cost, though the difference is in most cases by no means marked. Commercial stations usually pay the higher rate per kilowatt hour for salaries and wages, though they usually pay a considerably lower rate for current purchased than do municipal plants. Taxes, again, are an important item in the expenses of these commercial stations, while they also pay a much greater amount per kilowatt hour sold for depreciation. The percentage of the total expenses which is spent for depreciation is also higher for commercial stations, as well as the percentage which is paid for interest, except for the group "under 200,000 kilowatt hours."

The average rate of income from the sale of current is, as a rule, a little lower for commercial purchasing

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plants than for municipal plants in the same group. As usual, however, the lighting rates charged by municipal plants average lower than the rates of commercial plants. Power rates of the former are normally higher except for the group "500,000 but under 1,000,000 kilowatt hours," while municipal plants in this group rarely sell current to other companies.

The number of employees per station frequently averages higher for commercial purchasing plants than for municipal, but the average wages paid by the

former are usually higher. Again, the number of kilowatt hours sold per employee, because of the fewer number of employees, is in the main higher for municipal than for commercial plants. No definite comparisons, however, can be made between the average income per employee in the two groups.

The rate of dividends paid per kilowatt hour sold grows continuously lower as the size of purchasing plant increases, while the rate on the total investment tends to grow higher.

TABLE 97.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED STATIONS PURCHASING ALL CURRENT, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS PURCHASED: 1917.

GROUP.	Number of stations.	Average number of kilowatt hours purchased per station.	PERCENTAGE DISPOSAL OF CURRENT.				INCOME PER KILOWATT HOUR SOLD.						
			Light.	Power.	Other companies.	Losses in distribution, etc.	Total from all sources. ¹	Total from sales of current. ¹	Light. ¹	Power. ¹	Other companies.	All other income.	Net income.
United States:							Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
Commercial.....	877	1,225,251											
Municipal.....	541	299,678											
Under 200,000 kilowatt hours:													
Commercial.....	347	67,258	65.8	14.6	0.9	18.7	9.058	8.776	9.782	4.554	3.747	0.282	1.537
Municipal.....	322	50,251	71.2	10.5	1.2	17.1	8.867	8.732	9.348	4.707	5.801	0.135	1.747
200,000 but under 500,000 kilowatt hours:													
Commercial.....	96	327,080	53.4	24.1	2.5	20.0	6.774	6.532	8.031	3.618	2.601	0.242	1.208
Municipal.....	32	294,319	64.0	16.2	2.1	17.7	6.072	5.967	6.615	3.727	3.501	0.106	1.653
500,000 but under 1,000,000 kilowatt hours:													
Commercial.....	53	716,174	44.2	30.5	6.4	18.9	5.846	5.597	7.676	3.332	2.012	0.249	1.241
Municipal.....	12	682,983	70.2	13.5	.....	16.3	5.712	5.627	6,149	2.919	.....	0.085	1.636
1,000,000 but under 2,000,000 kilowatt hours:													
Commercial.....	24	1,424,207	35.4	37.9	8.6	18.0	4.371	4.271	7.062	2.197	1.963	0.096	0.671
Municipal.....	5	1,194,667	66.8	23.2	.....	10.0	4.994	4.931	5.693	2.734	.....	0.063	1.625
2,000,000 but under 5,000,000 kilowatt hours:													
Commercial.....	26	3,366,979	20.8	53.4	10.3	15.5	3.098	2.968	6.727	1.726	1.839	0.127	0.590
Municipal.....	2	2,761,000	46.9	43.7	.....	9.3	5.515	5.495	6.603	4.306	.....	0.017	0.603
5,000,000 but under 10,000,000 kilowatt hours:													
Commercial.....	9	8,118,339	19.7	55.0	13.1	12.2	3.153	3.001	7.782	1.653	1.482	0.152	0.581
10,000,000 but under 20,000,000 kilowatt hours:													
Commercial.....	8	15,274,251	22.7	54.8	12.1	10.4	1.771	1.705	3.119	1.191	1.521	0.047	0.166
20,000,000 but under 50,000,000 kilowatt hours:													
Commercial.....	5	27,874,363	22.0	53.0	13.3	11.7	2.578	2.518	5.800	1.644	0.596	0.058	0.417
50,000,000 but under 100,000,000 kilowatt hours:													
Commercial.....	3	61,701,857	0.3	43.6	50.1	6.0	0.547	0.536	8.830	0.476	0.536	0.011	0.043

GROUP.	EXPENSES.										
	Total per kilowatt hour sold.	Supplies and materials per kilowatt hour sold.	Salaries and wages.		Electric current purchased.			Miscellaneous expenses per kilowatt hour sold.	Insurance per kilowatt hour sold.	Taxes.	
			Per kilowatt hour sold.	Per cent of total expenses.	Cost per kilowatt hour purchased.	Cost per kilowatt hour sold.	Per cent of total expenses.			Per kilowatt hour sold.	Per cent of total expenses.	Per cent of investment.
Under 200,000 kilowatt hours:											
Commercial.....	Cents. 7.521	Cents. 0.594	Cents. 1.595	21.2	2.932	3.606	47.9	0.465	0.070	0.256	3.4
Municipal.....	7.120	0.781	0.977	13.7	3.655	4.408	61.9	0.145	0.024	0.002	0.8
200,000 but under 500,000 kilowatt hours:											
Commercial.....	5.566	0.392	1.256	22.6	1.909	2.386	42.9	0.454	0.053	0.244	4.4
Municipal.....	4.419	0.517	0.882	20.0	2.041	2.480	56.1	0.142	0.026	0.002	1.1
500,000 but under 1,000,000 kilowatt hours:											
Commercial.....	4.605	0.267	0.954	20.7	1.566	1.981	41.9	0.396	0.054	0.228	5.0
Municipal.....	4.076	0.462	0.778	19.1	1.805	2.156	52.9	0.193	0.032	0.060	1.2
1,000,000 but under 2,000,000 kilowatt hours:											
Commercial.....	3.700	0.240	0.680	18.4	1.343	1.638	44.2	0.251	0.039	0.162	4.4
Municipal.....	3.368	0.163	0.571	17.0	1.898	2.107	62.6	0.060	0.035	.....	0.9
2,000,000 but under 5,000,000 kilowatt hours:											
Commercial.....	2.508	0.129	0.362	14.4	1.049	1.241	49.5	0.228	0.018	0.118	4.7
Municipal.....	4.821	2.216	1.372	28.4	1.022	1.008	23.4	0.027	.....	.....	0.9
5,000,000 but under 10,000,000 kilowatt hours:											
Commercial.....	2.572	0.100	0.480	18.7	1.098	1.251	48.6	0.180	0.026	0.172	6.7
10,000,000 but under 20,000,000 kilowatt hours:											
Commercial.....	1.605	0.047	0.196	12.2	0.851	0.950	59.2	0.076	0.009	0.086	5.4
20,000,000 but under 50,000,000 kilowatt hours:											
Commercial.....	2.161	0.061	0.297	13.8	1.078	1.221	53.5	0.180	0.016	0.099	4.6
50,000,000 but under 100,000,000 kilowatt hours:											
Commercial.....	0.504	0.010	0.027	5.3	0.245	0.261	51.7	0.022	0.003	0.017	3.3

¹ Includes estimated value of free service.

TABLE 97.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE FINANCIAL AND OPERATING STATISTICS OF SELECTED STATIONS PURCHASING ALL CURRENT, GROUPED ACCORDING TO THE NUMBER OF KILOWATT HOURS PURCHASED: 1917—Continued.

GROUP.	EXPENSES—continued.					DIVIDENDS.		VALUE OF PLANT AND EQUIPMENT.		EMPLOYEES.			
	Depreciation.			Interest.		Per kilowatt hour sold.	Per cent of investment.	Per kilowatt hour sold.	Total income—Per cent of investment.	Number per station.	Average compensation.	Kilowatt hours sold per employee.	Total income per employee.
	Per kilowatt hour sold.	Per cent of total ex-penses.	Per cent of invest-ment.	Per kilowatt hour sold.	Per cent of total ex-penses.								
	<i>Cents.</i>			<i>Cents.</i>		<i>Cents.</i>		<i>Cents.</i>	30.0		<i>Dollars.</i>		<i>Dollars.</i>
United States:									27.9		5.0		5,796
Commercial.....										2.7			4,326
Municipal.....													
Under 200,000 kilowatt hours:													
Commercial.....	0.558	7.4	1.8	0.376	5.0	0.503	1.6	30.6	29.6	1.8	493	30,900	2,799
Municipal.....	0.113	1.6	0.5	0.069	9.4			22.2	39.9	1.0	400	40,905	3,627
200,000 but under 500,000 kilowatt hours:													
Commercial.....	0.373	6.7	1.6	0.407	7.3	0.416	1.8	22.9	29.6	4.1	801	63,759	4,319
Municipal.....	0.170	3.9	1.4	0.199	4.5			11.8	51.4	2.7	786	89,106	5,410
500,000 but under 1,000,000 kilowatt hours:													
Commercial.....	0.393	8.5	2.0	0.380	8.3	0.464	2.3	20.1	29.1	6.6	834	87,407	5,110
Municipal.....	0.294	7.2	4.2	0.081	2.0			7.0	81.6	6.1	731	93,997	5,369
1,000,000 but under 2,000,000 kilowatt hours:													
Commercial.....	0.342	9.2	2.0	0.348	9.4	0.397	2.3	17.4	25.2	10.1	784	115,328	5,042
Municipal.....	0.288	8.6	4.3	0.144	4.3			6.7	75.0	6.4	960	168,068	8,393
2,000,000 but under 5,000,000 kilowatt hours:													
Commercial.....	0.157	6.2	1.1	0.255	10.2	0.299	2.2	13.7	22.5	13.0	785	217,023	6,724
Municipal.....	0.076	1.6	0.5	0.003	0.1			14.1	39.2	25.0	1,374	100,125	5,522
5,000,000 but under 10,000,000 kilowatt hours:													
Commercial.....	0.185	7.2	2.5	0.178	6.9	0.252	3.4	7.5	41.9	38.2	896	186,444	5,879
10,000,000 but under 20,000,000 kilowatt hours:													
Commercial.....	0.099	4.3	1.1	0.173	10.7	0.153	2.3	6.5	27.3	31.0	866	441,536	7,818
20,000,000 but under 50,000,000 kilowatt hours:													
Commercial.....	0.162	7.5	2.3	0.124	5.8	0.194	2.7	7.0	36.6	99.0	742	249,693	6,438
50,000,000 but under 100,000,000 kilowatt hours:													
Commercial.....	0.089	17.6	4.4	0.077	15.2			2.0	27.1	17.3	892	3,345,058	18,302

DIAGRAM 32.—TOTAL EXPENSES, PER KILOWATT HOUR SOLD, FOR COMMERCIAL AND MUNICIPAL STATIONS PURCHASING ALL CURRENT: 1917 (CENTS).

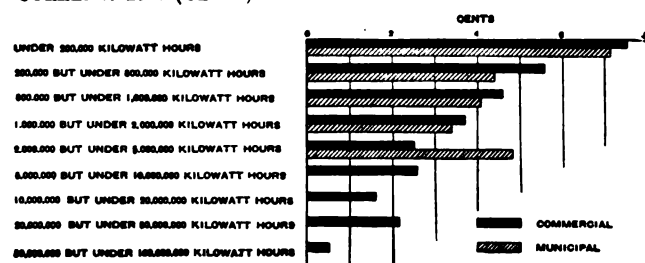
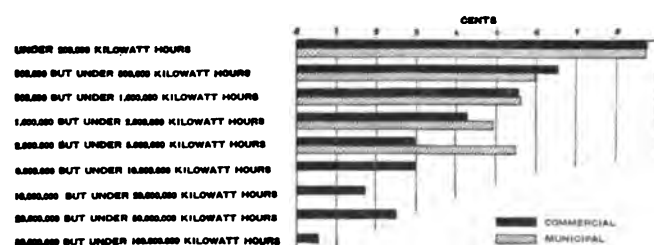


DIAGRAM 33.—TOTAL INCOME FROM SALE OF CURRENT, PER KILOWATT HOUR SOLD, FOR COMMERCIAL AND MUNICIPAL STATIONS PURCHASING ALL CURRENT: 1917 (CENTS).



In the matter of investment it is found that municipal plants nearly always have a much lower investment per kilowatt hour sold than do commercial plants. Further, the economies in investment which result from an increase in size of purchasing plants are

remarkably obvious. Whereas commercial stations in the lowest group report an average investment of 30.6 cents per kilowatt hour sold, those in the higher groups report an investment of only about 7 cents per kilowatt hour sold, and in the highest group, which is not typical, as little lighting service is rendered, the average is only 2 cents per kilowatt hour sold. In the ratio of total income to investment, municipal plants, as usual, have the advantage; nor is it apparent that any particular changes in this relation arise as the size of plant is increased.

Finally, mention should be made of the apparent economies which arise in connection with large purchasing stations. In this group of commercial plants we find a constantly decreasing expense per kilowatt hour sold until the group is reached which purchases "10,000,000 but under 20,000,000 kilowatt hours." After this point it is difficult to draw conclusions, inasmuch as the next two groups have very few plants. The highest group, purchasing "50,000,000 but under 100,000,000 kilowatt hours," is not typical, and in next to the highest group most items of expense are greater per kilowatt hour sold than in the group purchasing less than 20,000,000 kilowatt hours. The fact that this same group seemed to mark a halting point in the case of steam-generating plants suggests possible problems which it is not within the function of the Census Bureau to solve.

GENERAL TABLES.

The general tables listed below, which are shown on the following pages, present the fundamental data, as shown by the title, gathered at the 1917 census of central electric light and power stations. These data relate to commercial and municipal stations, considered separately and in combination, and embrace statistics of capitalization, income, expenses, primary power, equipment of stations and line equipment, and number of customers. The first of the tables is a comparative summary covering the whole field of the inquiry and including the figures for 1912 and 1907, as well as those for 1917.

TABLE 98.—Commercial and municipal central electric stations—Comparative summary, by geographic divisions and states: 1917, 1912, and 1907 (p. 144).

TABLE 99.—Commercial central electric stations—Balance sheet, by geographic divisions and states: 1917 (p. 150).

TABLE 100.—Municipal central electric stations—Balance sheet, by geographic divisions and states: 1917 (p. 152).

TABLE 101.—Commercial and municipal central electric stations—Income, by geographic divisions and states: 1917 (p. 154).

TABLE 102.—Commercial central electric stations—Income, by geographic divisions and states: 1917 (p. 155).

TABLE 103.—Municipal central electric stations—Income, by geographic divisions and states: 1917 (p. 156).

TABLE 104.—Commercial and municipal central electric stations—Expenses, by geographic divisions and states: 1917 (p. 158).

TABLE 105.—Commercial central electric stations—Expenses, by geographic divisions and states: 1917 (p. 160).

TABLE 106.—Municipal central electric stations—Expenses, by geographic divisions and states: 1917 (p. 162).

TABLE 107.—Commercial and municipal central electric stations—Primary power, by geographic divisions and states: 1917 (p. 164).

TABLE 108.—Commercial central electric stations—Primary power, by geographic divisions and states: 1917 (p. 166).

TABLE 109.—Municipal central electric stations—Primary power, by geographic divisions and states: 1917 (p. 168).

TABLE 110.—Commercial and municipal central electric stations—Generating and substation and main station equipment and output of stations, by geographic divisions and states: 1917 (p. 170).

TABLE 111.—Commercial central electric stations—Generating and substation and main station equipment and output of stations, by geographic divisions and states: 1917 (p. 172).

TABLE 112.—Municipal central electric stations—Generating and substation and main station equipment and output of stations, by geographic divisions and states: 1917 (p. 174).

TABLE 113.—Commercial and municipal central electric stations—Line equipment and number of customers, by geographic divisions and states: 1917 (p. 176).

TABLE 114.—Commercial central electric stations—Line equipment and number of customers, by geographic divisions and states: 1917 (p. 177).

TABLE 115.—Municipal central electric stations—Line equipment and number of customers, by geographic divisions and states: 1917 (p. 178).

ELECTRICAL INDUSTRIES: 1917.

TABLE 98.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE

DIVISION AND STATE.	Census year.	Number of stations.	INCOME.				Total expenses, including salaries and wages.	Total number of persons employed.	Number of customers furnished current.	Number of meters on consumption circuits.	PRIMARY POWER.		
			Total.	Electric service, including estimated value of free service.	All other sources.	Total horse-power.					Steam engines and steam turbines.		
											Num-ber.	Horse-power.	
1 UNITED STATES.....	1917	6,542	\$526,884,240	\$502,059,980	\$24,824,260	\$426,568,307	105,541	7,178,703	7,102,569	12,936,755	7,487	8,449,076	
2	1912	5,221	302,273,398	287,138,657	15,134,741	284,577,277	79,335	3,837,518	3,617,189	7,530,044	7,847	4,949,773	
3	1907	4,714	175,642,338	169,614,691	6,027,647	134,196,911	47,632	1,946,979	1,683,917	4,098,188	8,054	2,693,273	
GEOGRAPHIC DIVISIONS:													
4 New England.....	1917	383	54,277,840	52,459,789	1,818,051	41,955,716	10,157	647,289	662,346	1,278,181	502	922,819	
5	1912	368	29,684,799	28,457,210	1,177,559	21,414,431	7,352	313,227	312,278	735,244	590	519,426	
6	1907	365	18,660,504	18,123,382	537,122	12,576,539	5,068	162,875	161,800	415,794	673	280,940	
7 Middle Atlantic.....	1917	679	160,452,151	149,692,390	10,759,761	128,892,433	32,048	1,523,862	1,581,197	3,468,999	1,219	2,572,627	
8	1912	669	92,551,203	87,258,721	5,292,482	71,821,417	24,022	822,906	842,450	2,013,317	1,419	1,840,485	
9	1907	705	56,826,940	55,378,928	1,448,012	42,716,857	13,977	419,837	414,944	1,118,792	1,562	768,073	
10 East North Central.....	1917	1,385	118,260,188	114,821,296	3,438,892	98,581,368	24,361	1,919,165	1,884,042	2,911,630	1,813	2,441,563	
11	1912	1,260	67,454,476	63,390,456	4,064,020	53,414,485	19,233	972,903	940,883	1,690,999	2,025	1,404,897	
12	1907	1,295	35,896,969	34,141,889	1,757,080	26,290,791	10,324	485,534	425,378	1,060,999	2,190	690,946	
13 West North Central.....	1917	1,730	53,524,441	50,815,841	2,708,600	46,040,300	12,231	1,025,177	988,104	1,100,117	1,398	707,459	
14	1912	1,077	28,948,207	27,543,539	1,404,668	22,939,987	7,892	505,019	451,386	901,750	1,328	465,027	
15	1907	800	15,888,407	15,201,470	686,937	13,517,524	5,007	236,622	193,980	381,635	1,308	284,013	
16 South Atlantic.....	1917	728	30,928,954	30,081,719	847,235	24,559,144	5,948	357,577	323,970	1,104,746	754	552,899	
17	1912	512	16,649,394	16,138,196	511,198	12,284,150	4,317	193,909	167,314	624,780	669	278,154	
18	1907	390	7,672,229	7,490,058	192,171	7,012,180	2,622	93,471	72,130	295,265	573	157,283	
19 East South Central.....	1917	410	13,828,836	13,514,408	314,428	11,911,628	3,296	204,090	184,126	516,745	545	277,222	
20	1912	330	7,627,840	7,473,022	154,818	5,857,329	2,426	132,433	107,106	215,731	523	177,021	
21	1907	284	4,660,126	4,542,134	117,992	3,558,852	1,632	70,798	50,417	112,640	475	104,333	
22 West South Central.....	1917	636	19,596,169	19,171,271	414,898	15,662,797	4,757	373,180	345,279	340,530	745	286,377	
23	1912	507	12,474,439	12,209,711	264,728	9,165,847	3,655	223,283	192,764	233,563	780	206,206	
24	1907	395	7,426,620	7,299,900	166,720	5,905,917	2,474	117,055	83,181	131,782	636	125,030	
25 Mountain.....	1917	337	28,884,846	26,078,973	2,805,873	20,549,813	4,828	337,087	320,808	802,094	297	172,023	
26	1912	250	14,737,073	13,849,566	887,507	11,400,235	3,090	182,108	152,738	424,513	265	106,349	
27	1907	219	8,816,227	8,504,933	311,294	6,365,126	2,028	107,831	78,742	225,287	297	87,414	
28 Pacific.....	1917	254	47,150,815	45,424,293	1,726,522	38,415,108	7,915	791,276	812,702	1,413,713	219	516,087	
29	1912	248	32,195,997	30,818,236	1,377,761	26,279,396	7,348	491,730	450,270	990,147	278	448,213	
30	1907	261	19,792,316	18,981,997	810,319	16,253,125	4,480	252,956	203,395	578,712	381	196,241	
NEW ENGLAND:													
31 Maine.....	1917	93	3,169,388	2,910,645	258,743	2,404,786	772	51,213	50,767	98,248	52	22,478	
32	1912	79	2,118,058	1,815,086	303,422	1,577,938	629	28,511	25,062	89,683	58	19,610	
33	1907	81	1,453,016	1,324,648	128,368	1,181,255	502	19,614	16,230	57,880	53	18,114	
34 New Hampshire.....	1917	59	3,299,929	3,093,911	176,018	2,471,441	732	38,280	37,274	93,331	46	34,794	
35	1912	59	2,328,263	2,200,733	127,530	1,896,152	578	22,752	21,241	84,228	56	25,386	
36	1907	56	1,422,345	1,321,286	101,049	912,214	422	14,082	11,764	46,784	57	20,265	
37 Vermont.....	1917	59	2,009,515	1,937,974	71,541	1,611,292	443	33,147	30,353	73,760	32	17,285	
38	1912	61	1,228,361	1,182,797	45,564	824,443	340	22,380	18,880	50,363	40	14,996	
39	1907	60	841,701	795,391	46,310	682,003	297	15,361	12,698	38,566	41	9,889	
40 Massachusetts.....	1917	120	30,392,893	29,591,619	801,274	22,908,602	5,482	344,437	367,542	681,685	239	555,212	
41	1912	117	16,306,909	15,996,463	310,446	11,651,739	3,954	163,993	170,310	350,780	270	323,128	
42	1907	120	10,749,240	10,602,498	146,742	7,065,197	2,672	80,713	87,824	188,335	328	170,457	
43 Rhode Island.....	1917	9	4,714,851	4,410,560	304,291	3,617,656	790	43,817	45,637	135,871	23	131,006	
44	1912	8	2,305,176	2,204,999	100,177	1,654,848	511	19,088	24,276	50,499	18	46,934	
45	1907	7	1,724,659	1,627,190	97,469	1,053,639	450	11,591	13,212	27,986	46	24,723	
46 Connecticut.....	1917	43	10,721,264	10,515,080	206,184	8,941,939	1,938	136,395	130,773	195,286	110	162,042	
47	1912	44	5,347,552	5,057,132	290,420	4,109,311	1,340	56,503	52,609	109,691	118	89,372	
48	1907	41	2,469,543	2,452,359	17,184	1,682,231	745	21,514	20,072	56,243	123	37,492	
MIDDLE ATLANTIC:													
49 New York.....	1917	332	84,716,980	79,831,241	4,885,739	67,233,033	16,248	794,516	846,500	1,811,066	496	1,103,170	
50	1912	321	57,218,973	53,189,000	4,029,973	44,297,869	13,733	434,110	401,591	1,157,809	553	638,932	
51	1907	314	34,859,170	34,067,383	791,787	25,961,930	7,716	201,701	217,462	722,653	570	413,388	
52 New Jersey.....	1917	63	23,480,320	20,188,244	3,292,076	18,700,138	5,065	202,030	203,542	367,743	189	362,871	
53	1912	64	10,944,967	10,587,513	356,854	9,348,848	2,989	105,785	108,579	239,514	251	235,585	
54	1907	64	5,952,378	5,910,745	41,633	4,599,586	1,759	57,179	55,296	93,602	224	90,480	
55 Pennsylvania.....	1917	284	52,254,851	49,672,905	2,581,946	42,899,262	10,735	527,316	531,155	1,290,190	534	1,106,586	
56	1912	284	24,387,863	23,482,208	905,655	18,174,684	7,300	283,011	272,280	615,994	615	465,968	
57	1907	327	16,015,392	15,400,800	614,592	12,155,341	4,502	160,957	142,186	302,537	768	264,205	

1 Figures not available.

GENERAL TABLES.

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SUMMARY, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907.

PRIMARY POWER—continued.				KILOWATT CAPACITY OF DYNAMOS.			OUTPUT OF STATIONS.		NUMBER OF STREET LAMPS.		STATIONARY MOTORS SERVED.	
Internal-combustion engines.		Water wheels and turbines.		Total.	Direct current.	Alternating and polyphase current.	Kilowatt hours generated.	Kilowatt hours purchased.	Arc.	Incandescent and other varieties.	Number.	Horsepower capacity.
Number.	Horsepower.	Number.	Horsepower.									
2,934 1,116 463	210,406 111,035 55,828	3,374 2,939 2,481	4,277,273 2,469,231 1,349,087	8,994,407 5,165,439 2,709,225	436,687 476,240 487,452	8,557,720 4,689,199 2,221,773	25,438,303,272 11,569,109,885 5,862,276,737	5,605,745,962 2,613,502,605 (1)	256,950 348,643 (1)	1,392,284 681,957 (1)	555,924 435,473 167,184	9,216,330 4,130,619 1,649,026
46 50 24	5,505 7,317 4,123	560 520 462	349,857 208,501 130,731	918,152 514,898 289,388	29,511 39,368 66,008	888,641 475,521 224,380	1,835,584,072 865,379,442 473,802,067	578,110,859 136,821,236 (1)	24,484 29,633 (1)	184,843 124,432 (1)	101,513 55,042 23,841	876,600 391,308 154,720
176 171 108	26,489 26,564 12,112	566 559 508	869,883 646,268 338,607	2,362,759 1,378,811 765,140	166,792 158,759 150,199	2,195,967 1,220,052 614,941	7,659,317,763 3,548,605,306 2,009,304,160	1,917,380,779 989,404,314 (1)	77,896 109,039 (1)	325,276 125,133 (1)	157,087 124,416 34,108	2,596,057 1,213,681 544,020
453 218 120	27,633 22,120 10,475	758 686 573	442,434 263,982 136,890	2,089,849 1,204,828 559,760	120,624 132,054 129,554	1,969,225 1,072,464 490,206	5,757,150,135 2,527,964,097 1,075,933,354	615,605,822 276,742,512 (1)	75,464 106,688 (1)	297,124 114,419 (1)	119,080 114,404 49,345	1,920,649 799,421 307,558
1,371 416 94	71,489 26,003 6,211	296 224 188	321,169 110,720 91,411	780,138 404,172 245,252	51,684 54,168 54,246	728,454 350,004 191,006	1,776,475,522 712,595,442 386,180,647	790,508,038 183,535,438 (1)	16,324 24,751 (1)	209,881 102,291 (1)	65,188 47,540 19,027	787,051 1,213,681 138,027
141 54 18	12,877 6,098 1,445	337 298 194	538,970 340,528 136,537	735,619 415,529 195,309	17,862 22,809 20,664	717,757 392,720 174,645	1,745,295,143 729,896,397 266,437,175	416,165,234 407,716,658 (1)	13,514 17,679 (1)	89,954 44,202 (1)	19,589 26,163 8,948	515,293 361,011 95,373
118 13 3	4,630 1,080 60	81 47 29	284,893 37,630 8,247	366,532 150,042 77,059	14,769 17,181 12,602	351,763 132,861 68,457	1,048,814,771 227,664,808 118,681,967	355,590,851 15,948,772 (1)	12,098 15,247 (1)	41,449 18,816 (1)	15,383 7,592 3,039	128,127 62,081 21,656
465 151 59	46,892 16,679 8,690	41 35 24	7,261 8,678 8,062	242,375 158,369 88,910	19,609 23,201 28,826	222,766 135,168 66,084	482,645,862 233,947,656 138,755,648	157,608,725 38,763,468 (1)	12,927 14,326 (1)	51,312 27,083 (1)	25,684 15,337 7,220	273,467 103,765 42,507
122 20 13	11,476 2,695 855	363 291 216	618,565 313,469 137,018	533,997 261,119 151,082	7,859 8,869 11,873	526,138 252,250 139,159	2,086,194,737 845,338,832 381,082,187	338,811,725 188,201,530 (1)	9,469 8,150 (1)	46,704 23,317 (1)	21,978 12,114 6,091	632,439 285,506 94,960
42 23 19	3,415 2,479 16,867	372 329 292	894,211 539,455 366,614	964,986 677,980 337,370	7,977 19,821 18,480	957,009 658,159 318,895	3,096,825,266 1,877,662,856 1,012,199,537	435,968,929 376,368,677 (1)	15,274 23,130 (1)	145,741 102,264 (1)	30,442 32,865 15,565	1,506,647 647,733 250,205
7 3	180 135	192 175 182	75,590 69,938 39,766	63,242 58,757 39,390	2,188 3,763 7,005	61,054 54,994 32,285	165,504,379 117,092,565 66,136,651	39,824,680 6,279,802 (1)	322 1,411 (1)	17,918 9,839 (1)	3,890 2,258 1,304	56,985 32,535 19,372
11 11 8	1,228 1,906 1,115	106 115 101	57,309 56,937 26,404	65,560 57,768 31,917	2,486 3,261 3,782	63,074 54,507 28,135	160,456,223 126,593,970 55,258,921	19,194,805 3,238,565 (1)	67 1,482 (1)	14,768 9,100 (1)	3,743 1,958 1,081	41,020 18,488 10,281
1 2 4	50 95 206	109 108 101	56,425 35,272 28,472	51,751 29,468 21,834	690 133 1,401	51,061 29,285 20,453	65,079,504 42,656,884 29,923,333	34,107,260 1,973,139 (1)	356 1,013 (1)	9,046 5,563 (1)	3,448 1,966 776	43,503 28,695 9,778
17 22 12	2,067 3,172 1,097	93 58 58	124,386 24,480 16,781	478,983 252,732 135,924	14,297 21,357 33,892	464,636 231,375 102,032	937,124,653 386,254,294 219,425,607	287,031,988 93,001,454 (1)	16,375 17,601 (1)	100,441 67,372 (1)	65,218 37,191 15,877	446,025 228,868 81,246
5 5 4	1,125 1,125 1,000	17 13 16	3,728 2,440 2,263	106,017 38,509 21,040	1,500 3,659 10,181	104,517 34,850 10,859	161,856,170 62,106,528 35,651,323	83,091,898 2,091,719 (1)	2,065 3,058 (1)	16,203 10,640 (1)	5,283 3,690 2,082	72,094 28,186 12,947
5 7 6	835 885 706	44 51 54	32,409 19,434 18,045	152,649 77,655 39,363	8,350 7,145 8,747	144,299 70,510 30,616	345,563,143 130,672,201 67,406,232	114,860,228 30,181,567 (1)	5,299 5,088 (1)	26,467 21,918 (1)	19,931 7,979 2,741	216,973 59,536 21,146
70 66 26	5,948 6,471 3,315	421 405 362	701,948 512,408 305,950	1,202,804 772,030 482,081	76,150 69,024 59,914	1,126,654 708,006 422,117	3,828,592,181 2,175,048,634 1,452,222,471	1,526,331,264 863,543,416 (1)	20,373 47,391 (1)	156,940 62,706 (1)	62,181 32,525 18,051	1,193,264 795,256 393,955
26 21 11	3,545 2,360 1,328	12 18 22	1,327 1,569 1,794	249,521 179,477 70,566	34,219 35,428 24,984	215,302 144,049 45,582	781,239,790 383,891,504 140,527,522	39,319,823 10,378,072 (1)	13,480 16,052 (1)	53,652 33,797 (1)	30,679 12,772 5,994	262,858 85,011 27,604
80 84 66	16,996 17,733 7,469	133 136 119	166,608 132,293 30,863	910,434 427,304 212,543	56,423 54,307 65,301	854,011 372,997 147,242	3,049,494,792 989,665,167 416,554,167	349,729,692 115,462,826 (1)	43,543 45,596 (1)	114,684 28,630 (1)	64,227 29,119 10,063	1,139,935 323,414 122,461

ELECTRICAL INDUSTRIES: 1917.

TABLE 98.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE

DIVISION AND STATE.		Census year.	Number of stations.	INCOME.			Total expenses, including salaries and wages.	Total number of persons employed.	Number of customers furnished current.	Number of meters on consumption circuits.	PRIMARY POWER.			
				Total.	Electric service, including estimated value of free service.	All other sources.					Total horsepower.	Steam engines and steam turbines.		
												Num-ber.	Horse-power.	
EAST NORTH CENTRAL:														
1	Ohio.....	1917	335	\$23,019,378	\$22,149,856	\$869,522	\$20,717,691	4,714	353,183	356,872	583,341	427	557,717	
2		1912	304	11,906,111	11,514,628	390,483	8,722,293	3,131	174,467	170,756	337,272	506	317,160	
3		1907	272	7,643,997	7,474,980	169,017	6,027,780	2,157	100,071	92,964	179,111	515	171,446	
4	Indiana.....	1917	237	12,976,139	12,114,881	861,258	11,009,764	2,897	267,628	261,696	301,150	351	270,219	
5		1912	201	7,711,223	7,417,484	293,739	6,026,909	2,269	156,603	146,185	186,503	352	159,888	
6		1907	200	4,438,332	4,222,610	215,722	3,627,336	1,618	86,237	72,483	116,328	381	96,927	
7	Illinois.....	1917	303	46,245,976	45,402,293	843,683	37,921,833	9,294	682,290	661,956	1,046,386	503	982,740	
8		1912	269	30,045,297	27,376,119	2,669,178	23,557,887	8,036	364,046	356,074	645,631	576	605,227	
9		1907	383	15,465,993	14,566,772	899,221	10,055,463	3,902	167,645	146,208	299,246	733	287,898	
10	Michigan.....	1917	241	24,095,328	23,560,198	535,130	19,216,138	4,738	421,092	417,848	612,642	270	411,353	
11		1912	235	11,518,256	11,127,081	391,225	9,784,138	3,876	187,545	181,872	377,182	319	280,477	
12		1907	234	6,072,010	5,750,447	321,563	4,611,070	1,780	87,500	78,950	184,207	323	97,866	
13	Wisconsin.....	1917	269	11,923,367	11,594,068	329,299	9,715,942	2,718	194,402	185,675	368,111	262	219,534	
14		1912	251	6,274,589	5,955,194	319,395	5,321,258	1,921	90,242	85,996	145,411	272	72,145	
15		1907	206	2,278,637	2,127,080	151,557	1,969,142	867	44,061	34,773	58,899	247	37,809	
WEST NORTH CENTRAL:														
16	Minnesota.....	1917	255	12,968,715	12,080,171	888,544	11,191,974	2,520	219,045	217,391	228,241	250	119,001	
17		1912	195	6,937,841	6,647,199	290,642	5,580,525	1,568	104,504	98,660	148,111	247	63,184	
18		1907	171	3,478,009	3,333,469	144,540	2,986,277	1,062	54,214	46,701	121,826	250	48,741	
19	Iowa.....	1917	325	10,240,235	9,785,509	454,726	8,738,237	2,063	198,119	193,806	263,804	265	90,675	
20		1912	223	4,405,365	4,078,167	327,198	3,328,740	1,329	90,299	83,294	77,131	308	67,444	
21		1907	192	2,479,969	2,317,880	162,089	1,963,613	855	48,516	39,492	46,739	284	42,342	
22	Missouri.....	1917	293	14,434,506	13,974,980	459,526	12,790,587	3,767	276,463	258,117	225,910	309	199,950	
23		1912	190	9,746,600	9,299,495	447,105	7,484,853	2,434	143,997	120,689	182,096	301	177,721	
24		1907	162	5,805,828	5,683,795	122,033	5,341,126	1,800	61,575	50,670	111,416	362	108,451	
25	North Dakota.....	1917	127	2,003,826	1,712,441	291,385	1,647,691	419	35,378	32,567	29,079	117	24,679	
26		1912	42	873,111	835,504	37,607	714,294	232	15,618	14,489	16,169	74	15,851	
27		1907	29	533,383	480,042	53,341	413,506	150	7,999	6,498	10,277	58	9,972	
28	South Dakota.....	1917	131	2,062,067	1,897,277	164,790	1,745,255	449	42,184	40,290	33,126	57	16,150	
29		1912	77	1,162,522	1,065,922	66,600	965,763	338	20,391	18,644	27,748	50	16,008	
30		1907	37	513,682	492,767	20,915	433,841	169	7,940	6,500	12,964	52	10,251	
31	Nebraska.....	1917	297	4,860,874	4,640,262	220,612	3,911,923	1,227	116,970	111,158	112,108	186	89,119	
32		1912	174	2,802,614	2,678,240	124,374	2,239,542	882	61,814	57,995	52,168	156	42,452	
33		1907	98	1,562,669	1,474,426	88,243	1,158,060	404	27,086	22,710	30,020	135	26,221	
34	Kansas.....	1917	302	6,954,218	6,725,201	229,017	6,014,633	1,766	137,018	134,773	207,854	209	167,885	
35		1912	176	3,020,154	2,909,012	111,142	2,626,270	1,109	68,396	57,615	98,328	192	32,372	
36		1907	111	1,514,867	1,419,091	95,776	1,201,101	567	29,292	21,364	48,374	167	38,085	
SOUTH ATLANTIC:														
37	Delaware, District of Columbia, and Maryland.....	1917	63	9,192,308	9,008,297	184,011	7,454,423	1,399	108,178	107,630	204,131	72	199,864	
38		1912	56	5,388,403	5,304,333	84,070	4,213,854	1,249	66,466	62,230	116,744	112	111,622	
39		1907	50	3,347,728	3,298,747	48,981	3,819,147	1,024	33,333	32,614	85,346	148	83,584	
40	Virginia.....	1917	94	2,417,086	2,372,099	44,987	2,105,918	561	35,706	30,648	91,030	88	40,335	
41		1912	67	805,022	794,858	10,164	567,459	341	14,948	10,642	59,585	66	15,120	
42		1907	51	390,628	380,779	9,849	261,795	178	6,999	2,835	14,619	40	5,008	
43	West Virginia.....	1917	72	3,583,492	3,508,995	74,497	2,975,345	753	32,520	29,680	130,693	87	116,894	
44		1912	58	1,167,583	1,148,089	19,494	867,848	439	18,165	14,833	43,185	88	34,064	
45		1907	48	724,253	699,919	24,334	534,365	262	9,404	5,936	21,428	75	16,876	
46	North Carolina.....	1917	159	6,406,511	6,223,116	183,395	4,130,854	921	51,603	44,395	231,033	109	61,865	
47		1912	94	1,453,786	1,404,167	54,619	1,046,217	453	25,076	20,800	64,983	89	14,952	
48		1907	71	543,322	527,672	15,650	437,215	248	9,719	6,068	20,688	81	10,721	
49	South Carolina.....	1917	82	2,505,414	2,259,115	246,299	3,509,305	721	32,226	26,746	263,990	83	33,409	
50		1912	61	4,499,800	4,265,983	233,817	2,850,961	683	17,062	16,765	218,496	68	39,486	
51		1907	40	901,537	865,708	35,829	634,375	261	8,064	6,632	84,115	51	8,535	
52	Georgia.....	1917	176	3,447,235	3,375,221	72,014	2,698,730	915	47,235	41,907	125,674	174	50,055	
53		1912	126	1,968,599	1,881,985	86,614	1,655,420	697	29,109	21,109	87,951	156	35,274	
54		1907	93	1,110,510	1,086,601	23,909	844,557	384	15,452	10,075	54,704	104	18,229	
55	Florida.....	1917	82	2,376,908	2,334,876	42,032	1,684,569	678	50,110	42,964	58,195	141	50,477	
56		1912	50	1,361,201	1,338,781	22,420	1,052,696	455	21,944	20,935	33,826	90	27,636	
57		1907	37	664,251	630,632	23,619	480,726	265	10,540	7,970	14,370	74	14,330	

* Figures not available.

GENERAL TABLES.

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SUMMARY, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907—Continued.

PRIMARY POWER—continued.				KILOWATT CAPACITY OF DYNAMOS.			OUTPUT OF STATIONS.		NUMBER OF STREET LAMPS.		STATIONARY MOTORS SERVED.	
Internal-combustion engines.		Water wheels and turbines.		Total.	Direct current.	Alternating and polyphase current.	Kilowatt hours generated.	Kilowatt hours purchased.	Arc.	Incandescent and other varieties.	Number.	Horsepower capacity.
Num-ber.	Horse-power.	Num-ber.	Horse-power.									
119	12,008	33	13,616	420,481	38,213	382,268	1,083,514,202	124,012,007	23,498	40,042	35,960	265,280
98	11,252	35	8,890	244,182	49,450	194,732	399,101,309	4,782,890	30,898	20,168	29,022	145,331
53	5,628	21	2,087	126,533	40,121	86,412	217,311,924	(1)	(1)	(1)	18,063	64,941
46	3,268	90	27,993	227,825	10,344	217,481	441,423,385	71,605,086	11,610	46,376	14,269	139,704
17	1,700	90	23,915	135,901	14,065	121,836	236,944,000	18,724,511	14,989	19,873	14,005	91,897
15	1,296	88	19,806	81,576	19,290	62,286	130,263,698	(1)	(1)	(1)	5,182	33,716
119	4,661	90	53,985	737,621	44,772	692,849	2,210,372,750	245,263,854	15,002	134,508	20,559	1,079,652
35	3,042	92	37,862	477,917	33,707	444,210	1,150,900,306	130,851,420	35,899	41,065	46,278	315,659
19	870	80	10,478	209,226	44,250	164,976	467,657,328	(1)	(1)	(1)	21,675	137,661
77	3,074	314	198,215	451,276	11,243	440,028	1,504,236,843	42,706,367	18,102	41,365	37,854	348,808
27	1,626	245	125,079	247,789	13,565	234,224	525,015,608	90,008,555	16,220	22,425	18,400	174,009
11	908	249	86,738	101,714	15,069	86,645	208,154,199	(1)	(1)	(1)	7,069	53,245
92	4,622	231	143,955	252,646	16,047	236,599	517,599,955	132,018,558	7,252	25,833	10,428	87,280
46	4,500	176	68,766	98,839	20,737	78,102	215,402,974	32,375,136	9,187	10,888	6,099	72,525
22	2,079	140	19,001	40,711	10,994	29,707	52,546,210	(1)	(1)	(1)	2,366	17,995
148	8,092	90	101,148	162,854	9,199	153,655	440,932,508	313,050,016	5,565	48,223	20,915	282,784
54	4,755	76	90,172	98,502	13,854	79,648	186,045,055	119,509,835	6,496	21,777	12,268	75,973
22	1,428	71	71,656	78,516	14,364	64,152	87,579,431	(1)	(1)	(1)	3,711	41,096
158	7,251	92	165,373	184,506	10,699	173,807	614,908,584	49,228,325	2,364	49,812	13,042	89,902
52	2,658	58	7,029	53,237	13,611	39,626	67,166,647	11,572,613	3,637	27,479	8,773	48,520
11	564	44	3,833	32,066	12,297	19,769	37,729,072	(1)	(1)	(1)	2,643	14,547
174	7,295	12	13,965	166,813	9,188	157,625	266,431,159	385,848,906	4,413	30,101	10,710	174,861
22	2,472	5	1,902	122,786	10,859	111,927	232,823,763	43,210,364	6,687	16,719	15,429	116,971
13	963	5	2,002	68,467	10,988	57,479	147,328,446	(1)	(1)	(1)	8,923	54,111
157	4,400	-----	-----	20,041	7,249	12,792	22,978,006	2,359,714	497	11,245	2,281	11,102
8	318	-----	-----	10,824	4,607	6,217	12,298,553	664,130	644	5,074	1,145	6,128
2	205	1	100	5,819	3,789	2,030	8,229,765	(1)	(1)	(1)	327	1,816
178	10,006	11	6,970	24,323	2,913	21,410	31,810,487	2,245,415	611	7,578	3,145	19,708
86	4,832	15	6,913	20,032	2,492	17,540	24,703,754	173,269	904	4,382	1,394	13,619
10	528	12	2,205	10,046	1,488	8,558	13,615,015	(1)	(1)	(1)	279	3,649
261	12,480	57	10,504	78,227	5,868	72,359	129,531,181	6,208,247	178	37,762	7,842	57,435
91	3,832	44	5,884	34,586	4,810	30,776	56,299,682	1,947,733	2,451	12,149	3,575	26,325
17	845	19	2,954	20,041	4,080	15,961	31,958,789	(1)	(1)	(1)	1,719	10,776
275	21,965	24	13,004	143,374	6,578	136,796	269,983,648	31,567,415	2,666	35,170	7,253	121,259
108	7,136	26	8,820	69,205	4,435	64,770	133,252,988	6,457,494	3,983	14,711	5,021	33,277
19	1,678	36	8,661	30,307	7,300	23,007	59,740,179	(1)	(1)	(1)	1,425	12,083
18	1,237	24	3,030	131,238	4,758	126,480	326,439,753	186,395,126	5,928	22,483	1,046	188,192
11	1,073	33	4,049	89,887	10,410	79,477	118,034,857	96,878,745	5,404	16,469	13,718	76,527
5	130	18	1,632	62,956	10,900	52,056	78,412,197	(1)	(1)	(1)	6,523	32,856
22	821	70	49,874	65,913	1,944	63,969	107,580,758	24,628,890	813	12,813	2,243	27,763
3	185	63	44,280	40,512	1,956	38,556	28,724,684	1,002,471	2,513	4,369	753	8,570
1	60	44	9,551	9,195	1,496	7,708	10,308,360	(1)	(1)	(1)	268	3,690
30	7,300	15	6,499	108,611	6,975	96,636	204,107,945	30,199,566	2,151	5,996	3,833	98,573
24	3,065	14	6,036	29,772	4,510	25,262	42,344,796	14,600,808	2,066	2,922	1,279	22,925
9	925	11	3,627	14,726	2,764	11,962	24,571,817	(1)	(1)	(1)	340	4,432
17	511	85	168,657	153,410	896	152,514	371,711,733	57,670,402	1,545	11,741	3,744	59,504
3	80	52	49,951	43,099	814	42,285	70,552,737	15,021,654	1,887	5,582	1,876	32,830
-----	-----	32	9,962	13,911	2,147	11,764	13,171,681	(1)	(1)	(1)	249	4,345
13	482	80	230,099	159,255	1,142	158,113	500,430,903	96,081,004	1,348	9,700	2,338	37,509
3	455	88	178,555	132,408	2,615	129,793	356,771,757	271,607,613	2,196	2,875	5,452	155,385
1	150	52	75,430	51,271	191	51,080	68,696,424	(1)	(1)	(1)	990	37,838
17	518	58	75,101	84,330	1,314	83,016	184,136,069	19,458,915	480	14,600	4,238	81,517
4	720	45	51,957	56,232	1,581	54,651	87,571,815	8,281,120	3,370	7,283	1,964	50,633
1	140	37	36,335	35,446	1,702	33,744	59,311,202	(1)	(1)	(1)	410	11,078
24	2,008	5	5,710	37,812	363	37,449	50,887,992	1,731,401	1,249	12,621	2,097	22,235
6	500	8	5,700	23,619	923	22,696	25,995,751	374,252	1,213	4,762	1,121	14,141
1	40	-----	-----	7,804	1,474	6,330	11,765,994	(1)	(1)	(1)	189	1,584

ELECTRICAL INDUSTRIES: 1917.

TABLE 98.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COMPARATIVE

DIVISION AND STATE.		Census year.	Number of stations.	INCOME.			Total expenses, including salaries and wages.	Total number of persons employed.	Number of customers furnished current.	Number of meters on consumption circuits.	PRIMARY POWER.			
				Total.	Electric service, including estimated value of free service.	All other sources.					Total horse-power.	Steam engines and steam turbines.		
												Number.	Horse-power.	
EAST SOUTH CENTRAL:														
1	Kentucky.....	1917	125	\$4,436,445	\$4,334,938	\$101,507	\$3,531,547	1,031	91,738	85,481	98,752	166	96,066	
2		1912	89	2,754,115	2,683,137	70,978	2,244,906	907	51,204	41,200	81,787	171	81,191	
3		1907	83	1,660,700	1,610,475	50,225	1,283,918	585	24,282	18,350	41,984	157	41,969	
4	Tennessee.....	1917	106	4,937,285	4,877,359	59,926	4,436,698	1,008	52,078	48,714	201,912	129	69,679	
5		1912	90	2,448,218	2,408,762	39,456	1,753,875	656	35,326	29,678	68,994	130	40,799	
6		1907	78	1,299,983	1,266,610	33,373	882,763	416	16,426	11,397	28,730	128	27,490	
7	Alabama.....	1917	82	3,152,709	3,018,778	133,931	2,895,713	806	34,669	28,740	182,708	126	79,232	
8		1912	69	1,257,720	1,234,540	23,180	980,169	456	23,890	17,870	34,473	94	24,574	
9		1907	55	1,012,743	997,506	15,237	872,302	343	16,261	11,436	26,404	84	19,377	
10	Mississippi.....	1917	97	1,302,397	1,283,333	19,064	1,047,670	451	25,605	21,191	33,288	130	32,245	
11		1912	82	1,167,787	1,146,583	21,204	878,379	407	22,013	15,358	30,497	128	30,457	
12		1907	68	686,700	667,543	19,167	519,899	288	13,829	9,234	15,522	106	15,497	
WEST SOUTH CENTRAL:														
13	Arkansas.....	1917	96	1,801,889	1,737,999	63,890	1,450,358	456	42,449	32,177	36,599	130	31,496	
14		1912	74	1,053,763	1,016,664	37,099	749,029	360	20,500	15,035	25,860	115	22,599	
15		1907	63	675,718	664,916	10,802	491,871	244	12,071	6,503	13,963	98	13,641	
16	Louisiana.....	1917	85	3,244,789	3,220,314	24,475	2,459,868	669	47,536	46,861	36,005	81	29,248	
17		1912	50	2,278,754	2,251,102	27,652	1,604,019	489	27,838	26,538	27,165	86	26,175	
18		1907	42	1,352,383	1,329,128	23,255	1,291,908	541	15,972	15,116	23,292	86	22,872	
19	Oklahoma.....	1917	201	4,306,782	4,212,933	93,849	3,540,643	1,101	88,047	81,451	83,097	223	68,869	
20		1912	130	2,357,950	2,287,329	70,621	1,888,706	785	46,860	37,860	53,922	194	45,821	
21		1907	72	1,106,316	1,097,134	9,182	1,025,702	414	20,565	13,937	22,623	113	22,423	
22	Texas.....	1917	254	10,282,709	10,000,025	232,684	8,211,928	2,531	195,148	184,790	184,829	311	156,762	
23		1912	253	6,783,972	6,654,616	129,356	4,924,093	2,021	128,085	113,331	126,616	385	113,611	
24		1907	218	3,792,203	3,668,722	123,481	3,096,436	1,275	68,447	47,625	71,914	339	66,094	
MOUNTAIN:														
25	Montana.....	1917	60	9,695,196	7,947,011	1,748,185	5,474,008	732	59,176	56,588	279,004	39	8,684	
26		1912	29	3,883,410	3,292,385	591,025	2,411,668	514	32,312	30,543	115,710	38	12,750	
27		1907	33	2,469,131	2,376,472	92,659	1,469,808	319	17,630	15,106	68,817	31	11,830	
28	Idaho.....	1917	46	2,368,619	2,202,356	166,263	1,947,657	469	39,218	37,507	56,422	10	2,650	
29		1912	38	1,615,940	1,580,082	35,858	1,537,260	324	26,078	17,694	56,375	14	4,525	
30		1907	42	719,396	694,489	26,906	475,818	188	12,656	7,160	13,694	19	2,202	
31	Wyoming.....	1917	43	1,036,921	951,101	85,820	894,375	261	19,590	14,151	27,462	58	22,837	
32		1912	20	607,085	595,465	11,630	445,789	163	8,437	6,729	11,596	45	10,162	
33		1907	18	317,580	303,683	13,897	235,846	96	5,116	3,199	5,125	34	4,360	
34	Colorado.....	1917	69	6,364,534	6,201,965	162,669	4,960,727	1,269	92,242	93,679	140,009	105	65,467	
35		1912	73	4,791,340	4,626,693	164,647	3,997,780	1,166	68,046	66,359	131,734	91	56,499	
36		1907	56	3,410,240	3,317,844	92,396	2,785,401	918	46,911	41,060	82,427	141	56,547	
37	New Mexico.....	1917	29	894,207	874,317	19,890	839,575	256	13,988	12,765	17,108	37	13,226	
38		1912	21	497,896	488,422	9,473	449,516	158	8,551	7,129	11,015	32	8,428	
39		1907	15	292,682	289,962	2,720	226,937	83	4,494	2,701	4,548	26	4,085	
40	Arizona.....	1917	29	2,141,633	2,103,305	38,328	1,752,154	436	24,320	24,303	38,662	28	23,870	
41		1912	16	1,173,186	1,128,862	44,324	923,258	217	12,668	10,256	22,075	33	12,775	
42		1907	15	569,850	544,192	25,658	464,360	148	5,854	5,025	7,746	32	6,926	
43	Utah.....	1917	47	5,444,807	4,965,930	478,877	4,018,963	1,215	77,058	72,721	226,595	15	34,189	
44		1912	45	1,549,265	1,530,080	19,205	1,206,729	401	19,887	9,329	60,588	6	1,000	
45		1907	31	666,241	627,332	37,909	461,675	198	11,212	2,197	35,960	10	1,279	
46	Nevada.....	1917	14	938,929	833,088	105,841	662,359	190	11,495	9,069	16,832	5	1,100	
47		1912	8	618,942	607,597	11,345	428,255	147	6,129	4,699	15,420	6	2,210	
48		1907	9	372,108	352,959	19,149	245,291	78	3,958	2,305	6,980	4	235	
PACIFIC:														
49	Washington.....	1917	88	4,296,906	4,201,276	94,629	3,433,747	1,112	115,488	114,954	151,088	46	36,270	
50		1912	70	3,087,721	2,976,297	111,424	2,270,132	1,078	73,421	66,106	95,884	55	18,128	
51		1907	71	3,410,542	3,219,814	190,728	2,388,628	885	46,452	38,699	67,224	64	11,016	
52	Oregon.....	1917	68	2,577,297	2,454,047	123,250	2,276,199	636	55,985	57,735	68,706	46	27,082	
53		1912	66	1,422,703	1,380,785	41,918	1,205,738	532	33,627	24,290	46,015	54	15,879	
54		1907	61	1,965,245	1,840,155	125,090	1,283,560	467	33,475	21,312	126,815	66	24,681	
55	California.....	1917	96	40,277,613	38,768,970	1,508,643	32,705,192	6,167	619,808	640,013	1,193,969	127	452,755	
56		1912	112	27,685,573	26,461,154	1,224,419	22,803,526	5,738	384,682	359,874	848,248	169	414,206	
57		1907	129	14,416,529	13,922,028	494,501	12,580,937	3,128	173,029	143,384	384,673	201	156,644	

1 Figures not available.

GENERAL TABLES.

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SUMMARY, BY GEOGRAPHIC DIVISIONS AND STATES: 1917, 1912, AND 1907—Continued.

PRIMARY POWER—continued.				KILOWATT CAPACITY OF DYNAMOS.			OUTPUT OF STATIONS.		NUMBER OF STREET LAMPS.		STATIONARY MOTORS SERVED.	
Internal-combustion engines.		Water wheels and turbines.		Total.	Direct current.	Alternating and polyphase current.	Kilowatt hours generated.	Kilowatt hours purchased.	Arc.	Incandescent and other varieties.	Number.	Horsepower capacity.
Num-ber.	Horse-power.	Num-ber.	Horse-power.									
63	2,301	7	385	69,442	6,646	62,796	122,630,433	20,352,906	6,757	10,890	9,192	63,784
6	576			54,062	7,144	46,918	75,563,179	7,029,210	7,332	5,278	4,106	22,621
1	15			29,140	5,944	23,196	37,232,623	(1)	(1)	(1)	1,124	9,962
18	581	56	131,652	145,335	2,066	143,269	564,914,272	323,253,612	2,861	15,107	3,391	43,213
4	445	32	27,750	49,640	3,113	46,527	75,544,863	7,999,736	3,988	6,732	1,720	20,357
		14	1,240	20,911	2,265	18,646	34,847,956	(1)	(1)	(1)	1,193	4,524
8	705	18	102,856	128,509	3,681	124,828	330,771,965	11,900,279	1,702	7,212	1,583	17,363
2	19	15	9,890	24,477	4,442	20,035	48,602,553	362,500	2,314	2,806	1,065	11,148
1	20	15	7,007	17,124	4,342	12,782	30,846,764	(1)	(1)	(1)	541	5,650
29	1,043			23,246	2,376	20,870	30,498,101	83,962	778	8,240	1,217	13,767
1	40			21,863	2,482	19,381	27,924,183	557,326	1,663	4,001	701	7,955
1	25			9,884	1,061	8,823	15,704,624	(1)	(1)	(1)	181	1,520
44	2,561	10	2,540	24,913	2,447	22,466	38,644,801	3,359,482	1,138	9,302	1,112	11,533
5	221	10	3,040	16,335	2,053	14,282	17,795,660	107,216	1,045	4,731	994	5,283
1	12	1	300	9,678	2,599	7,079	11,519,316	(1)	(1)	(1)	196	1,177
72	6,757			25,762	5,623	20,139	26,009,144	83,688,132	4,295	7,266	2,863	37,189
9	980			19,169	5,997	13,172	18,325,080	35,170,130	4,474	4,451	2,428	24,557
3	420			15,175	5,762	9,413	26,421,316	(1)	(1)	(1)	1,713	16,110
135	12,800	5	1,368	57,783	3,610	54,173	100,737,632	22,339,501	1,925	13,763	6,375	61,268
38	5,965	7	2,135	38,301	4,130	34,171	48,824,067	101,727	3,303	8,334	3,470	23,056
2	200			15,499	3,120	12,379	24,965,903	(1)	(1)	(1)	1,666	6,586
214	24,714	26	3,353	133,917	7,929	125,988	317,254,285	48,216,610	5,569	20,961	15,334	163,477
99	9,502	16	3,503	84,564	11,321	73,243	149,008,819	8,364,395	5,504	9,667	8,445	50,899
53	3,068	23	2,762	48,558	12,345	36,213	75,829,108	(1)	(1)	(1)	4,223	18,634
39	1,403	78	268,917	182,079	1,852	180,227	965,453,777	231,458,307	1,966	10,664	7,374	306,241
1	75	64	102,385	74,388	1,635	72,753	376,212,617	41,860,494	1,560	2,791	1,962	75,184
		62	56,967	39,602	2,410	37,192	137,379,261	(1)	(1)	(1)	971	33,240
4	148	71	53,624	37,103	99	37,004	145,307,596	21,914,295	924	6,863	867	12,668
		63	51,850	35,656	126	35,530	115,812,222	7,638,874	1,109	2,886	1,723	27,142
		37	11,492	7,082	147	6,965	9,577,588	(1)	(1)	(1)	406	4,064
23	1,937	12	2,688	20,627	662	19,965	27,391,551	260,535	339	3,728	826	14,957
1	100	11	1,334	8,212	1,077	7,135	11,580,567	(1)	396	1,168	672	6,224
		6	765	3,208	1,003	2,205	5,499,064	(1)	(1)	(1)	131	685
11	527	58	74,015	94,791	3,946	90,845	274,223,978	59,596,806	3,272	10,141	8,843	132,013
1	80	64	75,155	71,668	3,391	68,277	165,196,068	67,182,657	3,559	7,872	4,780	60,451
4	300	47	25,680	53,130	6,029	47,101	123,275,212	(1)	(1)	(1)	3,232	41,161
22	3,252	7	630	12,713	936	11,777	17,244,768	722,688	13	2,287	729	7,626
9	1,770	9	817	7,961	876	7,105	9,027,824	2,713,654	247	627	639	4,064
		6	513	3,789	925	2,864	4,614,349	(1)	(1)	(1)	195	1,231
15	3,592	4	11,200	26,972	300	26,672	65,731,753	14,516,807	430	4,194	1,364	16,505
		4	9,300	14,756	991	13,765	32,960,084	6,787,266	454	1,335	741	12,547
3	70	4	750	4,939	777	4,162	9,392,302	(1)	(1)	(1)	339	2,220
		112	192,406	147,359	64	147,295	486,995,136	5,035,888	2,511	7,824	1,005	126,555
		63	59,588	37,935	435	37,500	96,634,658	61,761,367	321	5,237	1,044	37,490
		45	34,671	33,592	522	33,070	61,672,661	(1)	(1)	(1)	406	5,519
8	617	21	15,115	12,353	338	12,353	53,846,178	5,316,397	14	1,003	970	15,874
8	670	13	12,540	10,513	60	10,175	44,966,772	27,218	204	401	553	12,384
6	485	9	6,260	5,690		5,630	29,621,730	(1)	(1)	(1)	411	6,850
16	600	70	114,168	99,875	3,455	96,420	242,370,956	13,262,882	1,047	26,594	5,678	64,694
3	165	64	77,591	57,283	1,658	55,625	71,414,473	23,236,790	2,661	20,223	2,279	28,148
2	90	48	56,118	66,308	5,484	60,824	257,785,236	(1)	(1)	(1)	1,933	29,686
15	578	80	41,066	47,917	870	47,047	107,896,973	13,294,216	489	10,366	3,284	31,682
9	334	60	29,802	32,416	624	31,792	58,789,342	4,575,499	1,128	6,239	1,527	15,843
6	182	72	102,052	32,587	3,877	28,710	92,807,992	(1)	(1)	(1)	2,072	20,452
11	2,237	222	738,977	817,194	3,652	813,542	2,746,567,337	409,411,831	13,738	108,781	21,480	1,410,271
11	1,960	205	432,082	588,281	17,589	570,742	1,747,459,041	348,556,388	19,341	75,802	29,059	603,742
11	16,585	172	208,444	238,480	9,119	229,361	661,606,309	(1)	(1)	(1)	11,560	200,067

TABLE 99.—COMMERCIAL CENTRAL ELECTRIC STATIONS—BALANCE SHEET, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	ASSETS.														Total— Assets or liabilities
	Value of plant and equipment.	Other physical property.	Stocks and bonds of other electric companies.	Stocks and bonds of companies other than electric.	Treasury securities.		Other permanent invest- ments.	Cash and notes and receivable.	Materials and supplies.	Stock and bond discount.	Sinking and other special funds.	Interest, dividends, and rents receivable.	Sundries.	Profit and loss deficit for compe- dies showing a deficit.	
UNITED STATES.															
GEOGRAPHIC DIVISIONS:															
New England:															
Maine	237,851,257	5,442,885	1,682,247	5,427,796	790,285	1,312,273	2,392,247	16,646,558	7,547,181	887,702	1,976,324	126,980	3,251,967	356,388	285,792,142
New Hampshire	767,740,627	2,400,313	44,869,228	25,710,055	2,638,526	3,306,728	11,730,313	54,626,586	16,867,600	7,866,263	4,994,570	3,224,169	26,308,674	2,786,929	979,672,822
Vermont	288,284,441	10,263,563	1,662,077	11,293,261	2,159,300	7,417,448	5,390,080	34,100,869	13,164,532	6,800,150	4,345,096	129,337	7,203,714	1,945,838	334,342,204
West North Central	268,540,411	1,032,643	19,066,441	1,210,712	7,747,448	5,190,636	3,066,010	11,682,850	6,184,581	5,366,215	3,115,192	182,510	5,014,939	1,703,533	361,040,660
South Atlantic	172,639,749	5,894,016	6,214,781	5,182,486	166,301	5,420,060	243,625	12,418,137	2,889,149	2,837,878	2,127,118	91,094	5,197,809	1,068,906	223,040,488
East South Central	132,457,183	3,133,381	1,656,092	1,066,337	166,337	5,474,988	314,325	6,184,440	1,164,969	2,837,878	2,127,118	91,094	5,197,809	1,068,906	223,040,488
West South Central	104,224,832	3,133,381	3,574,180	39,958	39,958	34,317	338,020	12,989,427	1,749,899	1,757,804	249,057	32,221	1,305,758	483,463	119,842,038
Mountain	261,628,362	384,791	46,631,669	6,956,262	2,653,965	9,483,121	1,066,985	12,989,427	2,918,967	6,408,992	208,274	208,274	2,115,788	483,463	334,838,363
Pacific	428,306,046	2,490,000	4,137,713	4,494,299	7,483,194	6,723,350	1,201,344	20,451,202	5,967,699	25,811,885	5,629,396	297,149	1,651,206	1,592,166	516,738,649
NEW ENGLAND:															
Maine	27,872,766	39,249	135,163	2,126,355	792,396	284,300	1,943,710	1,326,710	486,127	191,616	147,003	13,131	477,790	49,282	35,876,497
New Hampshire	20,384,087	24,620	84,500	1,834,383	1,000	21,000	1,188,159	1,188,159	324,818	183,180	47,886	15,753	598,693	115,433	24,881,231
Vermont	14,888,396	1,778	109,400	87,872	5,378	21,000	1,675,884	1,675,884	129,294	343,720	208,011	66,238	109,136	123,841	16,980,477
Massachusetts	124,788,908	2,253,163	1,234,383	129,500	1,512	170,000	9,865,052	9,865,052	4,336,082	60,940	1,153,598	7,402	1,496,284	39,310	143,398,379
Rhode Island	17,073,309	241,647	1,234,383	689,500	1,512	170,000	1,770,264	1,770,264	831,885	110,266	136,665	16,457	359,010	28,322	23,014,924
Connecticut	32,883,982	2,883,428	1,234,383	689,500	1,512	170,000	1,770,264	1,770,264	831,885	110,266	136,665	16,457	359,010	28,322	39,940,684
MIDDLE ATLANTIC:															
New York	415,608,131	934,501	14,899,712	20,310,475	268,844	839,831	30,917,149	9,208,182	1,924,908	1,924,908	2,488,008	1,210,708	21,864,098	1,838,788	539,154,292
New Jersey	97,259,099	43,521	103,511	32,265	37,000	2,220,800	8,894,185	8,894,185	1,708,773	567,752	247,790	1,554,530	696,533	142,457	109,176,686
Pennsylvania	254,873,397	1,421,861	29,866,245	5,376,335	2,352,584	5,245,131	4,402,032	19,815,252	5,653,513	3,663,873	1,758,172	37,914	3,774,723	806,674	341,341,844
EAST NORTH CENTRAL:															
Ohio	88,655,173	888,981	29,091	461,489	48,550	531,067	1,692,760	1,712,581	2,557,590	1,183,765	1,512,425	57,744	2,802,856	982,155	108,376,327
Indiana	86,880,946	483,789	645,729	1,013,969	299,813	781,869	1,115,333	4,345,018	1,409,632	1,009,631	2,013,669	4,941	1,756,632	331,708	99,973,156
Illinois	200,950,032	1,679,188	197,700	2,853,112	1,448,007	2,853,112	7,729,179	14,463,213	2,189,703	2,029,245	262,443	1,538	2,807,945	267,086	238,272,006
Michigan	122,703,011	5,355,481	896,503	1,194,960	5,367,132	6,775,586	5,623,571	5,623,571	3,570,770	2,706,611	397,685	13,248	1,084,535	334,403	148,283,938
Wisconsin	59,107,282	1,576,133	330,064	32,416	1,064,004	569,380	2,166,172	2,032,516	1,553,196	941,948	1,085,844	4,768	454,006	53,611	69,439,779
WEST NORTH CENTRAL:															
Minnesota	73,631,897	144,787	11,044,006	28,754	31,015	226,091	1,869,357	2,604,065	1,299,477	2,436,795	1,095,532	103,217	666,387	58,722	95,380,052
Iowa	80,159,552	345,246	1,144,395	246,966	26,000	2,490,464	2,490,464	1,514,316	1,514,316	491,454	416,330	1,770	365,739	83,512	90,779,207
Missouri	65,645,839	42,967	3,353,114	788,556	1,968,546	1,968,546	118,527	3,314,929	1,042,996	985,837	231,896	823	2,109,375	264,732	77,515,608
North Dakota	7,562,839	42,108	3,720,387	32,878	6,807	385,077	171,541	385,077	171,541	374,146	141,210	86,990	124,940	29,432	13,610,163
South Dakota	14,111,604	19,844	1,511,407	52,468	265,209	385,045	180,233	385,045	265,209	374,146	70,263	20,779	79,263	59,650	17,331,665
Nebraska	27,073,338	282,011	686,819	12,830	25,952	985,558	2,640	985,558	425,651	51,794	632,619	12,180	133,471	181,991	30,608,784
Kansas	30,663,997	155,686	606,800	3,733	41,001	1,539,062	18,163	1,539,062	941,533	274,427	387,305	7,866	1,536,464	15,799	36,186,290
SOUTH ATLANTIC:															
Delaware, District of Columbia, and Maryland	43,315,047	141,709	782,131	2,269,144	35,600	50,760	116,156	3,716,184	1,177,791	1,319,547	1,896,840	9,835	1,203,549	54,831	56,092,114
Virginia	22,941,401	79,898	176,564	86,124	102,275	741,000	24,791	527,913	252,182	142,684	24,191	1,209	188,048	728,157	29,371,036
West Virginia	17,089,102	5,498,715	1,786,000	840,073	700	390,240	26,523	819,100	364,586	1,801,126	71,616	588	232,721	305,344	27,426,120
North Carolina	35,171,640	20,397	1,822,500	1,860,351	1,001	45,000	11,786	2,200,353	494,598	6,705	27,115	35,980	45,990	169,198	39,176,664
South Carolina	28,669,573	83,835	2,521,402	1,860,351	12,300	92,000	14,861	4,068,198	365,181	4,692	97,135	83,527	3,260,075	81,007	42,066,036
Georgia	20,107,602	83,182	123,184	92,128	15,426	67,000	39,137	685,046	96,299	58,633	7,964	63	194,073	311,896	22,591,086
Florida	5,345,384	71,282	123,184	4,666	15,426	92,000	39,137	685,046	138,741	30,511	2,367	4,992	70,363	46,435	6,302,832
EAST SOUTH CENTRAL:															
Kentucky	31,769,685	3,049,074	268,780	87,831	8,427	1,201,217	152	1,001,559	291,283	166,435	88,141	13,001	226,795	19,155	38,181,485
Tennessee	61,695,407	23,943	9,960	394,309	97,408	4,683,766	51,262	1,148,149	366,591	384,074	9,739	27,938	510,224	19,750	69,131,832
Alabama	35,826,033	48,468	1,338,390	57,015	200	4,683,766	262,911	3,910,881	441,476	3,062,219	15,975	2,960	229,542	99,870	45,296,408
Mississippi	3,166,048	11,966	48,972	5,000	200	63,722	123,831	123,831	66,069	45,150	66,991	507	13,905	77,582	3,679,553
WEST SOUTH CENTRAL:															
Arkansas	9,535,869	19,917	1,018,125	12,162	3,388	20,745	100,000	443,735	134,982	10,766	35,018	17,941	141,704	61,079	11,554,806
Louisiana	15,803,842	23,587	1,125,155	27,279	3,467	4,683,766	18,500	1,148,149	366,591	384,074	9,739	27,938	510,224	19,750	16,388,132
Oklahoma	20,806,650	10,222	2,638,900	27,017	2,417	174,217	164,871	3,910,881	441,476	3,062,219	15,975	2,960	229,542	99,870	25,866,716
Texas	58,278,471	141,523	5,000	27,500	3,467	35,200	174,217	3,846,287	1,243,238	1,337,009	99,945	4,681	796,328	168,670	66,037,958
MOUNTAIN:															
Montana	85,295,089	98,113	37,220,770	641,170	18,000	6,006,405	834,411	4,412,209	575,229	2,368,102	487,672	21,444	370,750	80,400	138,424,714
Idaho	27,875,340	26,352	2,033,166	136,309	21,200	2,245,477	24,338	1,649,321	324,019	565,785	1,727	1,720	358,983	61,616	35,431,243
Wyoming	4,118,002	183,754	183,754	9,207	21,200	151,400	47,096	346,602	102,555	16,310	9,948	4,254	1,142	82,784	4,967,354
Colorado	54,613,808	83,074	388,701	132,446	183,680	151,400	26,523	1,867,610	730,610	533,166	294,467	14,602	313,062	126,089	60,466,229
New Mexico	4,120,622	13,800	25	25	97,162	80,100	26,221	261,228	80,100	1,062	23,701	256	39,300	108,376	4,824,991
Arizona	11,853,487	8,869	6,346	70,360	421,306	675,527	675,527	675,527	232,552	623,391	52,873	256	39,300	26,918	14,024,158
Utah	57,576,025	8,949	6,500,000	5,650,609	2,083,000	490,000	81,350	3,314,293	775,495	2,394,146	3,773	165,968	12,929	2,330	78,960,697
Nevada	16,476,039	494,032	494,032	16,660	43,443	33,388	2,244	4,463,266	88,791	2,394,146	179,606	7,012	8,484	17,808,917	17,808,917
PACIFIC:															
Washington	32,109,905	148,874	102,708	691,497	630,972	490,060	754	931,877	386,305	938,774	82,464	7,012	106,788	150,541	36,623,551
Oregon	24,944,587	618,612	5,179	422,762	906,850	204,966	493,135	1,905,850	310,766	210,766	19,010	8,060	480,369	80,404	29,994,367
California	371,753,554	1,722,514	4,0												

GENERAL TABLES.

LIABILITIES.	DIVISION AND STATE.	Capital stock.	Funded debt.	Cash investments.	Real estate mortgages.	Floating debt.	Reserves.	Bills and accounts payable.	Interest, rents, and taxes due and accrued.	Dividends due and payable, but unpaid.	Premium on capital stock and funded debt.	Sundries.	Profit and loss surplus for companies, showing a surplus.	Net surplus. ¹																
Common.	Preferred.	Debt-ture.																												
UNITED STATES.....																														
GEOGRAPHIC DIVISIONS:																														
NEW ENGLAND:																														
Maine.....	118,000	17,342,640	300,000	50,488,938	376,373	450,760	39,272,727	9,366,787	5,589,388	1,353,857	1,289,378	25,583,492	983,870	15,453,183	15,126,795															
New Hampshire.....	840,952,867	39,626,922	2,400	332,570,654	1,465,286	7,921,253	27,151,066	60,948,725	33,860,339	13,274,009	1,151,051	192,199	13,094,645	81,540,469	78,752,470															
Vermont.....	201,717,160	51,783,460	1,833,460	247,029,051	6,138,734	1,055,832	26,187,339	4,126,947	14,706,231	3,015,880	1,326,745	71,060	3,343,606	30,905,432	28,957,470															
East North Central:	102,680,366	40,001,149	888,000	147,479,587	4,118,223	2,217,446	24,243,972	8,146,805	10,700,717	3,025,980	602,745	13,596	2,269,361	3,365,102	2,981,244															
West North Central:	73,534,252	20,242,622	778,000	85,457,312	1,205,852	856,014	11,446,060	8,778,528	10,700,717	1,862,269	27,481	67,638	1,869,100	6,855,348	6,136,240															
South Atlantic:	61,640,635	10,578,635	60,000	74,177,617	1,470,876	1,720,748	14,646,617	4,496,311	6,713,625	1,827,269	11,823	2,270,676	2,270,676	2,270,676	2,270,676															
West South Central:	42,436,943	14,794,968	4,937,000	45,986,620	1,470,876	426,878	6,235,261	2,897,016	3,064,357	1,827,269	11,823	2,270,676	2,270,676	2,270,676	2,270,676															
Mountain:	161,000,504	24,670,978	818,338	109,276,343	818,338	24,670,978	24,670,978	2,897,016	3,064,357	1,827,269	11,823	2,270,676	2,270,676	2,270,676	2,270,676															
Pacific.....	177,010,901	52,102,016	1,986,000	224,147,973	806,106	76,153	9,666,253	20,501,008	6,536,574	5,260,521	124,673	3,167	1,252,705	14,386,465	12,804,529															
NEW ENGLAND:																														
Maine.....	11,398,395	2,921,375	100,000	15,449,225	192,037	37,860	2,177,750	841,510	413,698	123,444	11,098	59,277	125,974	2,029,854	1,980,572															
New Hampshire.....	9,073,100	4,822,100	2,400	7,116,130	58,463	94,200	1,638,186	843,589	772,442	120,786	113,097	1,139	24,979	2,029,854	1,980,572															
Vermont.....	4,806,200	2,191,500	100,373	6,017,700	100,373	61,200	939,625	310,066	302,550	139,830	860,998	25,522,206	374,177	3,637,704	3,130,863															
Massachusetts.....	5,776,198	3,932,465	205,000	10,821,100	2,500,000	252,500	31,163,181	4,283,674	2,306,350	65,578	238,990	374,177	1,212,486	933,979	7,120,955															
Rhode Island.....	1,492,200	1,492,200	.....	.....	.....	.....	1,633,443	1,940,428	1,066,314	299,194	11,667	870	122,623	3,510,601	3,486,079															
Connecticut.....	21,114,576	2,043,000	200,000	7,946,577	25,500	6,000	1,660,642	2,067,220	1,066,314	299,194	11,667	870	122,623	3,510,601	3,486,079															
MIDDLE ATLANTIC:																														
New York.....	165,995,942	20,324,602	2,400	159,923,752	791,434	7,655,839	27,067,316	51,414,907	18,581,154	6,567,710	45,314	187,172	2,878,783	68,128,266	66,289,498															
New Jersey.....	56,724,838	1,594,750	.....	38,696,967	91,473	17,000	1,055,648	4,192,053	1,691,756	3,342,558	18,796	27	479,138	2,478,104	2,335,617															
Pennsylvania.....	118,632,387	18,717,570	.....	134,367,244	582,389	292,743	19,718,902	11,546,763	13,677,429	3,363,741	86,951	5,000	9,666,726	10,934,099	10,128,425															
EAST NORTH CENTRAL:																														
Ohio.....	28,052,309	8,163,632	671,460	35,380,000	1,705,884	22,700	8,175,451	12,812,462	5,479,794	1,313,453	268,610	675	1,939,865	4,390,043	3,407,888															
Indiana.....	18,293,480	8,482,010	267,000	27,065,218	3,247,008	200,958	6,582,654	3,811,356	8,833,176	3,277,816	27,816	7,500	1,522,383	3,282,004	2,900,392															
Illinois.....	88,365,719	14,491,648	270,000	94,185,979	865,106	276,725	6,582,039	15,498,082	2,727,652	4,002,584	69,667	8,710	8,976,365	10,386,365	10,129,400															
Michigan.....	21,626,273	11,626,273	166,000	61,125,273	2,060,823	309,669	4,592,319	4,511,264	3,102,271	1,223,422	922,532	54,165	467,455	8,976,864	8,642,461															
Wisconsin.....	17,807,581	9,074,768	.....	26,061,582	209,854	106,750	2,374,877	4,506,273	1,532,558	1,643,263	60,301	.....	256,892	3,921,040	3,877,429															
WEST NORTH CENTRAL:																														
Minnesota.....	22,283,456	12,451,799	.....	46,895,426	384,321	130,135	6,029,612	1,715,565	1,494,434	1,400,627	295,280	2,845	215,888	2,270,664	2,211,942															
Iowa.....	28,013,270	6,986,710	253,000	35,547,642	687,672	110,816	7,547,645	1,410,453	2,240,733	5,022,544	31,228	6,181	2,086,704	2,086,704	1,943,192															
Missouri.....	24,401,714	3,185,217	385,000	32,724,649	392,184	247,141	3,046,596	2,275,075	6,694,738	596,552	146,711	6,560	134,813	3,079,786	3,079,786															
North Dakota.....	2,217,283	2,912,434	.....	4,994,788	284,466	120,071	1,969,771	233,755	256,962	131,977	70,970	.....	15,667	408,980	3,379,558															
South Dakota.....	6,007,139	2,245,538	250,000	5,506,310	313,070	133,126	3,500,085	2,508,986	208,766	246,443	42,813	.....	42,813	633,596	623,940															
Nebraska.....	10,375,301	4,980,318	.....	7,566,048	924,507	924,507	2,187,725	1,267,999	1,379,770	167,858	12,642	.....	50,696	908,868	726,877															
Kansas.....	9,262,193	5,419,133	.....	11,335,827	1,402,456	322,650	2,122,736	1,066,974	3,351,973	239,879	10,060	3,850	326,747	1,681,812	1,666,013															
SOUTH ATLANTIC:																														
Delaware, District of Columbia, and Maryland.....	15,453,071	371,680	.....	31,035,114	174,050	24,650	1,992,547	3,415,556	651,435	813,339	165,918	23,500	295,961	1,672,193	1,617,362															
Virginia.....	9,154,066	2,778,700	15,000	14,475,824	141,006	122,500	1,412,152	99,961	338,550	304,806	3,704	.....	31,004	334,135	334,135															
West Virginia.....	10,378,551	2,253,600	760,000	9,614,284	81,625	248,823	1,868,729	204,399	922,588	105,886	2,589	.....	615,925	304,061	310,611															
North Carolina.....	10,419,770	4,992,100	.....	11,955,260	465,610	265,850	1,290,371	2,472,311	5,917,476	247,626	215,314	.....	986,462	2,089,312	2,089,312															
South Carolina.....	17,958,666	8,679,217	.....	8,645,345	79,454	104,500	1,150,871	1,581,389	9,974,476	156,895	476,396	3,981	5,733	2,269,674	2,188,667															
Georgia.....	8,008,425	5,645,675	.....	8,170,364	169,057	77,941	2,874,573	1,741,246	1,741,246	162,368	3,275	.....	11,600	1,106,918	1,106,918															
Florida.....	2,161,653	612,650	.....	1,566,421	109,057	19,750	916,535	122,766	1,741,246	31,334	.....	.....	57,152	441,863	441,863															
EAST SOUTH CENTRAL:																														
Kentucky.....	7,841,952	8,243,728	.....	17,228,640	205,345	70,470	1,288,100	591,156	1,515,766	421,303	8,322	5,850	305,634	404,219	385,054															
Tennessee.....	33,299,998	1,265,307	.....	24,412,231	152,008	42,000	2,067,072	458,066	4,296,352	1,161,453	.....	.....	200,334	1,065,613	1,065,613															
Alabama.....	152,000	1,155,060	.....	11,185,060	138,467	8,100	10,440,909	368,166	694,505	196,072	460	.....	75,972	606,828	606,828															
Mississippi.....	1,243,250	125,000	.....	1,378,750	133,467	.....	308,686	41,463	177,202	48,441	3,041	.....	43,137	174,016	96,434															
WEST SOUTH CENTRAL:																														
Arkansas.....	3,927,917	1,245,688	60,000	4,463,627	295,409	22,344	739,968	130,731	288,035	99,770	5,432	.....	49,705	226,179	165,100															
Louisiana.....	3,426,884	3,277,642	.....	7,319,380	115,500	58,650	1,331,361	579,536	386,014	157,529	10,253	.....	32,760	253,781	253,781															
Oklahoma.....	9,186,888	3,286,673	.....	9,507,963	145,213	187,505	734,925	628,761	1,025,766	226,751	20,999	.....	331,113	303,606	303,606															
Texas.....	26,988,654	6,724,660	.....	23,264,020	914,754	157,070	3,628,967	1,263,348	1,404,511	444,860	5,981	16,706	351,263	1,761,827	1,761,827															
MOUNTAIN:																														
Montana.....	67,126,441	11,004,462	.....	44,971,198	190,186	13,150	4,034,309	2,192,832	447,503	997,656	608,916	.....	2,446,663	4,432,403	4,352,033															
Idaho.....	17,265,086	1,220,555	.....	12,051,203	77,455	30,800	660,071	892,531	389,195	265,746	.....	250	2,092,433	4,488,609	4,488,609															
Wyoming.....	2,055,789	3,277,265	.....	2,055,789	205,662	13,500	387,242	139,029	108,246	47,078	.....	.....	219,652	219,652	219,652															
Colorado.....	27,958,968	3,335,995	.....	22,504,445	126,310	35,500	1,415,770	977,379	644,902	849,438	59,942	.....	472,238	2,089,312	2,089,312															
New Mexico.....	2,023,283	3,45,000	.....	1,599,880	2,500	26,100	453,767	249,600	31,291	31,291	.....	.....	32,710	1,119,213	1,119,213															
Arizona.....	5,419,111	1,409,680	.....	3,444,275																										

A minus sign (—) denotes deficit.

TABLE 100.—MUNICIPAL CENTRAL ELECTRIC STATIONS—BALANCE SHEET, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	ASSETS.												Total— Assets or Liabilities.
	Value of plant and equipment.	Other physical property.	Stocks and bonds of com- panies other than electric.	Treasury secu- rities, bonds.	Other perma- nent invest- ments.	Cash and notes and accounts receivable.	Materials and supplies.	Stock and bond dis- count.	Sinking and other special funds.	Interest, divi- dends, and rents receiv- able.	Sundries.	Profit and loss deficit for stations showing a deficit.	
UNITED STATES.....	\$127,375,200	\$2,626,531	\$60,869	\$208,254	\$1,279,472	\$8,737,386	\$3,281,215	\$25,786	\$2,784,285	\$14,427	\$1,297,945	\$653,795	\$148,345,165
GEOGRAPHIC DIVISIONS:													
New England.....	6,974,554	15,787	.....	.....	27	570,122	340,690	.....	604,737	1,030	17,149	109,624	8,633,720
Middle Atlantic.....	6,165,116	14,224	2,000	.....	34,500	378,231	130,790	536	122,260	1,227	110,918	13,075	6,972,907
East North Central.....	49,201,395	118,945	14,454	133,000	81,536	3,561,831	972,038	100	497,083	1,974	1,042,251	95,189	55,719,796
West North Central.....	20,418,743	201,828	3,000	74,642	38,450	1,563,845	725,859	510	343,005	3,310	19,761	168,540	23,561,493
South Atlantic.....	11,726,970	41,493	.....	.....	1,092,047	633,340	208,964	990	114,622	3,542	40,091	101,845	13,963,904
East South Central.....	5,108,496	33,390	.....	.....	15,465	135,913	97,581	.....	84,576	825	145	69,106	5,545,797
West South Central.....	6,800,321	8,345	.....	.....	400	399,860	136,989	.....	32,406	.....	2,494	62,298	7,412,102
Mountain.....	2,431,941	125	.....	.....	3,500	213,083	60,575	660	54,178	43	739	21,981	2,786,515
Pacific.....	18,547,664	2,192,394	41,415	612	13,547	1,311,171	608,729	23,000	931,089	2,476	64,397	12,137	23,748,631
NEW ENGLAND:													
Maine.....	401,575	.....	.....	.....	.....	13,240	16,505	.....	.....	.....	3,323	4,649	439,292
New Hampshire.....	180,735	1,000	.....	.....	.....	887	550	.....	40,636	.....	.....	694	224,701
Vermont.....	1,094,554	593	.....	.....	.....	72,086	43,518	.....	.....	.....	4,171	6,063	1,220,985
Massachusetts.....	4,137,035	14,194	.....	.....	27	390,718	243,082	.....	415,624	1,030	3,696	98,218	5,203,622
Rhode Island.....	30,000	.....	.....	.....	.....	327	1,270	.....	.....	.....	.....	.....	31,597
Connecticut.....	1,130,655	.....	.....	.....	.....	92,864	35,765	.....	148,278	.....	5,960	.....	1,413,523
MIDDLE ATLANTIC:													
New York.....	2,529,716	7,933	2,000	.....	34,500	216,388	78,934	431	26,171	1,040	1,646	11,581	2,910,340
New Jersey.....	943,659	.....	.....	.....	.....	82,650	29,114	105	89,850	.....	108,941	800	1,265,119
Pennsylvania.....	2,691,741	6,291	.....	.....	.....	79,193	22,742	.....	6,269	187	331	694	2,807,448
EAST NORTH CENTRAL:													
Ohio.....	9,172,571	8,750	.....	110,000	22,874	1,559,496	247,124	.....	334,287	.....	280,819	55,273	11,801,194
Indiana.....	5,632,266	1,862	.....	.....	30,000	655,317	204,267	.....	72,306	1,955	19,131	2,331	6,619,434
Illinois.....	21,499,414	83,668	14,264	20,000	10,000	740,637	227,006	100	65,542	.....	679,960	3,888	23,344,449
Michigan.....	9,068,401	13,513	.....	3,000	11,699	259,483	157,253	.....	12,375	.....	34,143	8,575	10,198,442
Wisconsin.....	3,198,743	11,162	200	.....	6,963	346,896	136,388	.....	12,574	19	18,208	26,122	3,756,277
WEST NORTH CENTRAL:													
Minnesota.....	4,511,433	145,837	.....	.....	.....	417,360	243,649	510	76,792	1,856	2,473	50,701	5,450,611
Iowa.....	3,584,152	14,630	8,000	10,000	24,700	358,773	90,527	.....	43,638	1,112	408	47,192	4,128,032
Missouri.....	2,626,101	6,482	.....	3,300	13,300	227,282	41,339	.....	46,628	342	1,947	8,559	2,975,275
North Dakota.....	443,793	.....	.....	.....	.....	33,208	23,077	.....	61,327	.....	60	.....	561,465
South Dakota.....	811,616	6,383	.....	.....	.....	43,837	31,007	.....	7,200	.....	70	11,950	912,063
Nebraska.....	2,947,606	16,276	.....	.....	.....	203,180	108,763	.....	3,135	.....	117	16,001	3,295,078
Kansas.....	5,544,042	12,320	.....	61,342	450	280,205	187,497	.....	104,290	.....	14,686	34,137	6,238,969
SOUTH ATLANTIC:													
Delaware, District of Columbia, and Mary- land.....	700,723	2,378	.....	.....	.....	40,855	9,909	.....	1,800	.....	630	39,003	795,298
Virginia.....	1,749,342	.....	.....	.....	.....	25,251	26,642	.....	35,700	.....	.....	.....	1,836,935
West Virginia.....	151,125	2,000	.....	.....	.....	5,038	5,583	.....	1,600	.....	.....	4,901	1,739,247
North Carolina.....	2,391,509	17,701	.....	.....	.....	53,051	51,167	.....	10,000	2,692	.....	18,079	2,544,199
South Carolina.....	956,507	14,438	.....	.....	7,800	64,917	31,451	.....	15,479	533	36,396	3,638	1,131,159
Georgia.....	2,602,343	4,976	.....	.....	3,000	163,914	58,145	990	39,892	317	2,183	31,543	2,907,303
Florida.....	3,175,421	.....	.....	.....	1,061,247	280,314	23,067	.....	10,151	.....	882	4,681	4,575,763
EAST SOUTH CENTRAL:													
Kentucky.....	944,635	.....	.....	.....	.....	6,530	17,968	.....	4,967	.....	.....	300	974,400
Tennessee.....	1,656,588	.....	.....	.....	14,465	43,675	32,481	.....	6,489	.....	.....	42,479	1,796,177
Alabama.....	971,866	3,000	.....	.....	1,000	15,247	12,088	.....	.....	600	145	16,717	1,020,663
Mississippi.....	1,535,407	30,390	.....	.....	.....	70,461	35,044	.....	73,420	225	.....	9,610	1,754,567
WEST SOUTH CENTRAL:													
Arkansas.....	951,860	345	.....	.....	.....	64,940	16,378	.....	10,000	.....	1,840	12,193	1,067,556
Louisiana.....	1,372,655	.....	.....	.....	.....	170,961	20,125	.....	.....	.....	64	2,291	1,566,086
Oklahoma.....	2,721,863	500	.....	.....	400	62,432	46,256	.....	18,000	.....	.....	32,326	2,882,377
Texas.....	1,753,943	7,500	.....	.....	.....	71,517	53,230	.....	4,406	.....	.....	15,488	1,906,063
MOUNTAIN:													
Montana.....	312,488	.....	.....	.....	.....	32,276	17,021	.....	.....	.....	282	508	362,570
Idaho.....	501,492	.....	.....	.....	3,500	47,334	3,639	.....	6,969	.....	.....	251	563,185
Wyoming.....	106,778	125	.....	.....	.....	6,964	1,882	.....	7,643	.....	.....	546	123,638
Colorado.....	429,129	.....	.....	.....	.....	22,481	11,752	.....	9,550	.....	.....	683	473,686
New Mexico.....	171,621	.....	.....	.....	.....	3,961	2,395	.....	.....	.....	.....	650	178,637
Arizona.....	107,397	.....	.....	.....	.....	20,518	3,026	660	.....	43	.....	2,993	134,637
Utah.....	777,605	.....	.....	.....	.....	74,485	20,910	.....	30,016	.....	457	16,355	919,838
Nevada.....	25,431	.....	.....	.....	.....	5,064	250	.....	.....	.....	.....	.....	30,745
PACIFIC:													
Washington.....	7,854,363	2,190,000	.....	612	11,547	742,439	495,860	23,000	618,926	1,780	43,216	.....	11,981,743
Oregon.....	877,210	.....	.....	.....	.....	33,523	9,061	.....	5,164	.....	.....	12,137	937,095
California.....	9,816,091	2,394	41,415		2,000	535,209	103,808		306,999	696	21,181		10,829,798

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TABLE 100.—MUNICIPAL CENTRAL ELECTRIC STATIONS—BALANCE SHEET, BY GEOGRAPHIC DIVISIONS AND STATES: 1917—Continued.

DIVISION AND STATE.	LIABILITIES.										Net surplus. ¹
	Funded debt.	Cash investments.	Real estate mortgages.	Floating debt.	Reserves.	Bills and accounts payable.	Interest, rents, and taxes due and accrued.	Premium on funded debt.	Sundries.	Profit and loss surplus for stations showing a surplus.	
UNITED STATES.....	\$54,973,742	\$51,791,104	\$174,309	\$3,490,038	\$7,294,906	\$2,297,286	\$1,896,406	\$86,528	\$626,099	\$25,724,749	\$25,070,964
GEOGRAPHIC DIVISIONS:											
New England.....	3,404,704	2,472,144	3,342	590,096	297,062	242,618	27,433	12,914	12,532	1,570,845	1,461,221
Middle Atlantic.....	2,581,834	1,970,427	1,200	194,242	509,686	53,724	11,434	480	22,631	1,627,250	1,614,175
East North Central.....	12,387,742	31,521,067	160,292	264,252	2,778,415	676,913	1,700,430	38,017	164,050	6,028,618	5,983,429
West North Central.....	9,076,628	7,128,562	8,850	1,161,375	463,417	440,658	36,806	16,424	77,798	5,151,066	4,982,546
South Atlantic.....	5,553,656	3,163,186		258,988	1,190,066	208,575	20,451	110	4,488	3,564,394	3,462,549
East South Central.....	2,540,533	1,738,608		211,763	21,297	84,707	17,543	2,828	1,901	926,817	857,711
West South Central.....	3,511,035	2,138,834	625	183,241	32,140	103,892	22,449	5,000	56,724	1,388,162	1,325,864
Mountain.....	1,280,174	637,601		69,404	43,061	62,591	4,322		20,113	689,559	667,578
Pacific.....	14,657,536	1,020,685		586,677	1,969,752	423,608	45,538	10,955	265,862	4,778,018	4,765,881
NEW ENGLAND:											
Maine.....	67,000	209,649		11,300	2,098	24,428	996		26	123,795	119,146
New Hampshire.....	120,000	59,000		36,700		500	2,075			6,426	5,732
Vermont.....	665,718	228,179		104,067	73,467	8,567	2,346			140,651	134,588
Massachusetts.....	1,951,153	1,760,316		423,876	28,608	187,283	15,742	12,914	11,706	912,025	813,807
Rhode Island.....		25,000				1,000				3,597	3,597
Connecticut.....	600,833	192,000	3,342	12,163	192,919	20,840	6,274		800	384,351	384,351
MIDDLE ATLANTIC:											
New York.....	749,129	479,460	1,200	75,733	441,513	32,144	7,574		20,515	1,108,072	1,091,491
New Jersey.....	753,088	196,993		43,800	53,304	4,911	576		588	201,869	201,069
Pennsylvania.....	1,079,617	1,293,974		74,709	14,863	16,069	3,284	480	1,528	322,319	321,626
EAST NORTH CENTRAL:											
Ohio.....	7,548,805	2,128,064	109,067	100,998	535,359	259,392	292,889		12,122	814,498	759,225
Indiana.....	556,927	3,585,091	11,550	48,156	410,239	155,812	7,442	86	58,106	1,776,236	1,773,906
Illinois.....	412,535	19,222,530	7,000	30,872	1,139,226	83,442	1,371,770		23,681	1,063,063	1,049,205
Michigan.....	2,849,463	5,110,844		50,718	248,782	118,000	2,230	36,536	1,681	1,780,188	1,771,613
Wisconsin.....	1,009,712	1,474,538	32,375	33,508	444,819	60,767	26,099	1,396	68,461	604,603	579,481
WEST NORTH CENTRAL:											
Minnesota.....	1,577,318	2,218,758	4,000	398,553	140,797	59,984	7,550		11,276	1,082,425	981,724
Iowa.....	1,361,855	1,396,707	4,250	119,964	8,752	39,131	4,487	1,548	6,730	1,184,508	1,137,316
Missouri.....	834,866	996,065		74,140	40,965	24,602	2,995	796	19,062	980,795	972,226
North Dakota.....	188,867	97,350		28,404	10,430	17,305	1,358			217,851	217,851
South Dakota.....	815,100	268,197		129,612	6,000	23,210	2,787		9,062	168,075	151,126
Nebraska.....	1,298,589	752,643		224,041	168,603	64,787	4,134	81	21,967	759,943	743,942
Kansas.....	3,498,533	1,403,832	600	186,661	87,870	211,789	13,494	14,000	9,691	812,499	778,362
SOUTH ATLANTIC:											
Delaware, District of Columbia, and Maryland.....	288,700	214,147		25,300	61,311	15,829	2,900			187,111	148,108
Virginia.....	988,100	448,936		26,200	5,767	4,236	622			363,014	363,014
West Virginia.....	14,500	140,019		15,000		1,890	75			1,793	—3,108
North Carolina.....	1,618,627	406,145		38,400	7,478	43,030	2,112		428	428,979	410,900
South Carolina.....	604,315	143,421		56,065	9,752	40,095	10,871	110	87	296,443	292,805
Georgia.....	1,268,805	1,156,068		76,786	19,478	41,463	3,086			841,677	810,134
Florida.....	770,909	655,460		21,267	1,086,270	62,002	906		2,973	1,975,377	1,970,696
EAST SOUTH CENTRAL:											
Kentucky.....	94,590	807,154		38,410		3,845	200			30,201	29,901
Tennessee.....	788,494	749,758		117,478	5,047	23,338	3,127			106,937	66,458
Alabama.....	682,849	99,993		17,425		35,055	12,457		132	171,752	155,035
Mississippi.....	974,900	81,705		38,450	16,260	22,469	759	2,628	1,769	615,927	606,317
WEST SOUTH CENTRAL:											
Arkansas.....	314,825	562,689		26,970	16,071	17,827	5,006		7,804	106,364	94,171
Louisiana.....	574,011	697,960		37,700	85	26,147	8,797		110	232,306	230,015
Oklahoma.....	2,207,533	60,876		81,254	8,259	48,390	11,580		47,900	466,575	424,249
Texas.....	414,666	817,319	625	57,317	7,745	17,528	2,066	5,000	910	582,917	567,429
MOUNTAIN:											
Montana.....	80,348	13,000		13,000	2,146	26,876	1,851		2,315	223,034	222,531
Idaho.....	222,328	143,060		1,468		6,568			5,511	83,262	83,011
Wyoming.....	40,900	58,820			8,783	835				14,300	13,754
Colorado.....	122,300	62,177		6,463	18,340	9,814			1,385	253,116	252,433
New Mexico.....	131,600	9,000		10,000		3,429	412		4,300	29,886	29,236
Arizona.....	85,500	14,000		10,573	8,746	1,994	113		733	12,968	9,975
Utah.....	461,200	346,554		28,900	5,036	12,225	1,496		5,869	58,548	42,193
Nevada.....	15,000					850	450			14,445	14,445
PACIFIC:											
Washington.....	6,356,818	636,610		568,881	1,394,938	177,997	38,866	7,119	260,990	2,539,562	2,539,562
Oregon.....	453,400	55,243		17,796	87,321	79,271	1,750		924	241,380	229,253
California.....	7,847,318	328,832			477,493	166,440	4,890	3,836	3,948	1,997,036	1,997,036

¹ A minus sign (—) denotes deficit.

TABLE 101.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—INCOME, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	INCOME.									
		Gross income.	Electric service.						Interest and dividends from investments.		All other income.
			Total.	Commercial or private light and heat.	Commercial or private power.	Municipal street lighting.	Electric energy sold to other public service corporations.	Estimated value of free service.			
								Commercial stations.	Municipal stations.		
UNITED STATES.....	6,542	\$526,894,240	\$502,059,980	\$241,062,303	\$161,200,682	\$36,651,540	\$57,524,792	\$324,820	\$5,095,843	\$8,875,597	\$15,958,663
GEOGRAPHIC DIVISIONS:											
New England.....	383	54,277,840	52,459,789	24,059,282	16,934,235	4,996,281	6,236,568	3,513	229,910	426,796	1,391,265
Middle Atlantic.....	679	160,452,151	149,692,390	74,135,988	44,776,407	11,515,113	18,644,199	224,630	396,053	3,509,986	7,249,775
East North Central.....	1,385	118,260,188	114,821,296	54,673,756	36,616,157	8,373,130	13,406,053	109,883	1,642,317	948,567	2,490,325
West North Central.....	1,730	53,524,441	50,815,841	28,693,382	12,151,932	3,587,093	5,409,671	28,643	945,120	1,145,596	1,563,004
South Atlantic.....	728	30,928,954	30,081,719	12,554,245	12,243,526	1,911,109	2,487,832	21,635	963,372	153,162	694,073
East South Central.....	410	13,828,836	13,514,408	5,937,591	4,052,917	1,142,118	2,032,396	11,968	337,418	112,129	202,299
West South Central.....	636	19,586,169	19,171,271	11,439,168	4,664,174	1,196,899	1,282,690	29,540	558,800	80,540	334,358
Mountain.....	337	28,884,846	26,078,973	10,661,358	12,225,928	1,165,856	1,880,256	63,133	82,442	1,934,380	871,493
Pacific.....	254	47,150,815	45,424,293	18,907,533	17,535,406	2,763,941	6,145,127	31,875	40,411	564,451	1,162,071
NEW ENGLAND:											
Maine.....	93	3,169,388	2,910,645	1,266,304	815,592	274,388	509,709	140	44,512	20,380	238,363
New Hampshire.....	59	3,269,929	3,093,911	1,199,755	633,527	322,419	936,398	12	1,800	97,770	78,248
Vermont.....	59	2,009,515	1,937,974	810,447	676,912	142,150	300,321	50	8,094	13,637	57,904
Massachusetts.....	120	30,392,893	29,591,619	14,741,973	9,110,625	2,976,423	2,593,289	409	168,900	138,950	662,324
Rhode Island.....	9	4,714,851	4,410,560	1,587,669	1,748,435	488,950	582,241	28	3,237	118,435	185,856
Connecticut.....	43	10,721,264	10,515,080	4,453,134	3,949,144	791,951	1,314,610	2,874	3,367	37,614	168,570
MIDDLE ATLANTIC:											
New York.....	332	84,716,980	79,831,241	45,374,482	20,459,824	5,749,735	8,108,543	70,261	68,396	2,830,604	2,055,135
New Jersey.....	63	23,480,320	20,188,244	9,624,996	6,136,204	2,063,988	2,276,318	28,400	58,343	8,869	3,283,207
Pennsylvania.....	284	52,254,851	49,672,905	19,136,510	18,180,379	3,701,390	8,259,343	125,969	269,314	670,513	1,911,433
EAST NORTH CENTRAL:											
Ohio.....	335	23,019,378	22,149,856	9,938,558	8,318,757	1,953,391	1,523,620	26,635	388,895	105,899	763,623
Indiana.....	237	12,976,139	12,114,881	5,868,011	4,083,946	1,198,637	834,955	15,174	114,158	453,460	407,798
Illinois.....	303	46,245,976	45,402,293	22,419,234	11,472,119	3,329,968	7,649,293	60,583	471,096	366,166	477,517
Michigan.....	241	24,086,828	23,560,198	11,200,778	8,786,599	963,481	1,970,156	1,458	637,726	11,077	524,053
Wisconsin.....	269	11,923,367	11,594,068	5,247,175	3,954,736	927,653	1,428,029	6,033	30,442	11,965	317,334
WEST NORTH CENTRAL:											
Minnesota.....	255	12,968,715	12,080,171	6,543,518	3,465,238	994,533	958,298	4,568	114,021	595,326	293,218
Iowa.....	325	10,240,235	9,785,509	5,082,756	1,976,771	762,416	1,906,384	5,899	102,283	125,209	329,517
Missouri.....	293	14,434,506	13,974,980	8,432,250	2,910,887	591,301	1,647,762	5,319	387,461	10,226	449,300
North Dakota.....	127	2,003,826	1,712,441	1,268,309	258,859	159,115	19,739	2,754	3,665	246,846	45,039
South Dakota.....	131	2,062,067	1,897,277	1,293,919	337,998	174,859	32,100	908	57,493	99,848	64,942
Nebraska.....	297	4,860,874	4,640,262	2,916,378	966,084	388,789	245,953	3,271	119,787	38,667	181,945
Kansas.....	302	6,954,218	6,725,201	3,206,252	2,236,095	516,080	600,440	5,924	160,410	29,974	199,043
SOUTH ATLANTIC:											
Delaware, District of Columbia, and Maryland.....	63	9,192,308	9,008,297	5,125,463	2,663,023	828,102	355,330	341	36,038	26,915	157,096
Virginia.....	94	2,417,086	2,372,099	1,007,304	1,024,260	213,147	75,144	2,686	49,558	2,208	42,779
West Virginia.....	72	3,583,492	3,508,995	1,191,896	1,579,403	162,549	467,305	12,031	95,811	6,067	68,430
North Carolina.....	159	6,406,511	6,223,116	1,428,631	3,713,324	196,821	723,882	846	159,612	74,699	108,696
South Carolina.....	82	3,505,414	3,259,115	940,332	1,643,464	155,304	425,212	2,674	92,129	37,016	209,253
Georgia.....	176	3,447,235	3,375,221	1,319,795	1,192,267	109,328	401,445	1,777	350,609	5,708	66,306
Florida.....	82	2,376,908	2,334,576	1,540,824	427,785	245,858	39,514	1,280	79,615	549	41,453
EAST SOUTH CENTRAL:											
Kentucky.....	125	4,436,445	4,334,938	2,560,718	902,443	555,020	226,334	3,045	87,378	10,890	90,617
Tennessee.....	106	4,937,285	4,877,359	1,528,607	1,747,888	290,399	1,207,372	7,843	96,250	8,323	51,603
Alabama.....	82	3,152,709	3,018,778	1,006,770	1,245,873	154,618	552,101	338	59,078	92,916	41,015
Mississippi.....	97	1,302,397	1,283,333	841,496	156,718	142,081	46,589	742	95,712	.....	19,064
WEST SOUTH CENTRAL:											
Arkansas.....	96	1,801,889	1,737,999	1,153,119	276,845	130,804	77,576	5,123	94,532	31,860	32,030
Louisiana.....	85	3,244,789	3,220,314	2,028,018	600,460	322,822	201,407	3,587	64,020	3,165	21,310
Oklahoma.....	201	4,306,782	4,212,933	2,602,713	963,382	269,944	120,858	12,814	223,222	37,849	56,000
Texas.....	254	10,232,709	10,000,025	5,655,318	2,803,487	473,329	882,849	8,016	177,026	7,666	225,018
MOUNTAIN:											
Montana.....	60	9,695,196	7,947,011	2,205,972	4,720,919	231,119	780,201	200	8,600	1,499,217	248,968
Idaho.....	46	2,368,619	2,202,356	1,194,226	750,083	130,523	106,673	511	20,840	66,712	99,551
Wyoming.....	43	1,036,921	951,101	609,802	229,458	82,439	22,778	2,215	4,409	1,715	84,105
Colorado.....	69	6,364,534	6,201,865	2,899,185	2,464,159	402,545	437,699	2,113	6,164	25,648	137,021
New Mexico.....	29	894,207	874,317	561,239	224,724	39,000	27,183	2,260	19,911	815	19,575
Arizona.....	29	2,141,633	2,103,305	932,707	1,040,883	69,668	57,511	2,716	320	4,292	34,036
Utah.....	47	5,444,807	4,965,930	1,895,954	2,416,970	182,135	395,465	52,708	22,698	335,942	142,935
Nevada.....	14	988,929	833,068	372,273	379,232	28,427	52,746	410	.....	539	105,302
PACIFIC:											
Washington.....	88	4,295,905	4,201,276	2,465,327	1,169,858	420,543	133,519	2,249	9,780	13,861	80,768
Oregon.....	68	2,577,297	2,454,047	1,381,326	801,547	158,114	95,931	7,805	9,324	30,712	92,538
California.....	98	40,277,613	38,768,970	15,060,880	15,564,001	2,185,284	5,915,677	21,821	21,307	519,878	988,765

GENERAL TABLES.

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TABLE 102.—COMMERCIAL CENTRAL ELECTRIC STATIONS—INCOME, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	INCOME.								
		Gross income.	Electric service.						Interest and dividends from investments.	All other income.
			Total.	Commercial or private light and heat.	Commercial or private power.	Municipal street lighting.	Electric energy sold to other public service corporations.	Estimated value of free service.		
UNITED STATES.....	4,224	\$486,634,021	\$462,473,917	\$218,448,126	\$154,831,546	\$31,461,959	\$57,207,466	\$524,820	\$8,806,702	\$15,353,402
GEOGRAPHIC DIVISIONS:										
New England.....	311	51,380,584	49,632,765	22,551,466	16,136,930	4,726,566	6,214,290	3,513	412,155	1,335,664
Middle Atlantic.....	556	158,218,883	147,488,186	72,915,871	44,502,163	11,217,867	18,627,655	224,630	3,506,561	7,224,136
East North Central.....	818	105,628,571	102,391,027	48,888,071	34,399,593	5,629,777	13,363,703	109,883	912,316	2,325,228
West North Central.....	970	44,921,297	42,440,182	23,317,775	10,976,414	2,827,618	5,289,732	28,643	1,139,751	1,341,364
South Atlantic.....	398	26,154,070	25,345,049	9,705,956	11,551,930	1,585,586	2,479,942	21,635	151,319	657,702
East South Central.....	256	12,062,075	11,764,344	4,890,475	3,862,436	974,643	2,024,822	11,968	111,689	186,042
West South Central.....	445	17,018,737	16,619,134	9,760,541	4,453,916	1,143,921	1,231,216	29,540	80,215	319,388
Mountain.....	264	27,996,699	26,219,029	10,060,179	12,106,591	1,115,310	1,873,816	63,133	1,933,474	843,196
Pacific.....	206	43,264,105	41,574,201	16,357,792	16,841,573	2,240,671	6,102,290	31,875	559,222	1,120,662
NEW ENGLAND:										
Maine.....	87	3,035,539	2,782,590	1,239,182	811,722	222,287	509,259	140	20,380	232,569
New Hampshire.....	55	3,230,148	3,054,711	1,172,729	629,927	315,645	936,398	12	97,770	77,667
Vermont.....	43	1,765,278	1,713,313	663,398	650,429	109,586	289,850	50	13,637	38,328
Massachusetts.....	81	28,335,222	27,563,330	13,658,766	8,484,348	2,837,875	2,581,932	409	126,258	642,634
Rhode Island.....	8	4,702,972	4,398,681	1,579,890	1,748,435	488,087	582,241	28	118,435	185,856
Connecticut.....	37	10,311,425	10,120,140	4,237,501	3,812,069	753,086	1,314,610	2,874	32,675	158,610
MIDDLE ATLANTIC:										
New York.....	277	83,745,494	78,875,134	44,765,117	20,330,426	5,602,051	8,107,279	70,261	2,827,179	2,043,181
New Jersey.....	47	23,186,813	19,898,014	9,481,958	6,102,241	2,009,102	2,276,313	28,400	8,869	3,279,930
Pennsylvania.....	232	51,286,576	48,715,038	18,668,796	18,069,496	3,606,714	8,244,063	126,969	670,513	1,901,026
EAST NORTH CENTRAL:										
Ohio.....	186	19,901,974	19,065,761	8,234,455	7,762,336	1,539,915	1,522,420	26,635	92,140	724,073
Indiana.....	147	10,730,415	9,923,602	4,473,521	3,699,854	924,134	810,919	15,174	451,125	355,688
Illinois.....	182	42,477,793	41,680,315	21,662,247	10,623,845	1,686,494	7,647,146	60,583	346,363	451,115
Michigan.....	132	21,789,049	21,275,948	10,048,196	8,537,395	720,877	1,968,022	1,458	11,077	502,024
Wisconsin.....	171	10,729,340	10,425,401	4,469,652	3,776,163	758,357	1,415,196	6,033	11,611	292,328
WEST NORTH CENTRAL:										
Minnesota.....	122	11,028,211	10,233,491	5,292,735	3,178,768	812,666	944,754	4,568	594,500	200,220
Iowa.....	182	8,763,851	8,350,904	4,014,665	1,823,877	632,688	1,873,775	5,899	122,074	290,878
Missouri.....	206	13,061,673	12,637,987	7,672,103	2,783,074	554,277	1,623,214	5,319	9,962	433,724
North Dakota.....	101	1,788,826	1,505,976	1,126,314	229,218	128,951	19,739	2,754	246,346	35,504
South Dakota.....	95	1,688,493	1,531,638	1,041,237	307,340	153,316	28,837	908	99,848	57,007
Nebraska.....	148	3,620,187	3,418,585	2,113,009	809,571	259,919	232,815	3,271	38,667	162,935
Kansas.....	116	4,950,056	4,761,601	2,058,712	1,844,566	285,801	566,598	5,924	28,354	160,101
SOUTH ATLANTIC:										
Delaware, District of Columbia, and Maryland.....	47	8,950,324	8,766,315	4,973,100	2,626,855	812,040	353,979	341	26,915	157,094
Virginia.....	70	1,976,632	1,935,019	797,786	946,683	112,720	75,144	2,686	2,308	39,405
West Virginia.....	63	3,469,221	3,394,724	1,175,288	1,579,283	160,817	467,305	12,031	6,067	68,430
North Carolina.....	79	5,298,641	5,136,832	712,003	3,566,648	133,893	723,442	846	73,919	87,890
South Carolina.....	41	3,077,311	2,834,840	664,725	1,605,098	137,131	425,212	2,674	36,019	206,452
Georgia.....	48	2,052,031	1,987,857	517,933	999,040	73,761	395,346	1,777	5,708	58,466
Florida.....	50	1,329,910	1,289,462	865,121	228,323	155,224	39,514	1,280	483	39,966
EAST SOUTH CENTRAL:										
Kentucky.....	108	4,112,954	4,013,447	2,383,343	845,879	552,420	218,760	3,045	10,990	88,617
Tennessee.....	70	4,414,604	4,357,903	1,272,353	1,690,862	179,473	1,207,372	7,843	7,883	48,818
Alabama.....	37	2,767,773	2,634,530	745,957	1,207,319	128,815	552,101	338	92,916	40,327
Mississippi.....	46	766,744	758,464	478,822	118,376	113,935	46,589	742	.....	8,280
WEST SOUTH CENTRAL:										
Arkansas.....	71	1,418,879	1,356,977	903,539	245,291	125,448	77,576	5,123	31,860	30,042
Louisiana.....	49	2,657,101	2,638,114	1,651,266	541,615	281,542	160,104	3,587	3,165	15,822
Oklahoma.....	95	3,368,760	3,278,776	1,951,072	933,878	266,194	114,818	12,814	37,849	52,135
Texas.....	230	9,573,997	9,345,267	5,254,664	2,733,132	470,737	878,718	8,016	7,341	221,389
MOUNTAIN:										
Montana.....	54	9,526,367	7,791,556	2,068,284	4,692,152	220,719	780,201	200	1,499,217	285,594
Idaho.....	38	2,216,247	2,051,532	1,077,606	739,206	127,536	106,673	511	66,712	96,008
Wyoming.....	31	964,699	899,342	568,768	226,562	79,019	22,778	2,215	1,316	84,041
Colorado.....	53	6,189,702	6,032,377	2,783,613	2,427,609	382,820	437,222	2,113	25,388	130,937
New Mexico.....	25	820,506	801,678	517,905	217,970	36,360	27,183	2,260	315	18,515
Arizona.....	25	2,101,772	2,065,996	913,298	1,029,530	67,780	52,672	2,716	4,292	31,494
Utah.....	25	5,233,471	4,757,501	1,738,552	2,398,034	173,866	394,341	52,708	335,695	140,275
Nevada.....	13	922,933	818,047	362,153	375,528	27,210	52,746	410	539	104,347
PACIFIC:										
Washington.....	74	2,154,258	2,065,086	1,074,034	783,818	128,903	96,082	2,249	13,061	56,091
Oregon.....	53	2,366,158	2,242,908	1,241,800	765,586	131,786	95,931	7,805	30,712	92,538
California.....	79	38,733,680	37,246,207	14,041,958	15,292,169	1,979,982	5,910,277	21,821	515,429	972,063

TABLE 103.—MUNICIPAL CENTRAL ELECTRIC STATIONS—INCOME, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	INCOME.								
		Gross income.	Electric service.						Interest and dividends from investments.	All other income.
			Total.	Commercial or private light and heat.	Commercial or private power.	Municipal street lighting.	Electric energy sold to other public service corporations.	Estimated value of free service.		
UNITED STATES.....	2,318	\$40,260,219	\$39,586,063	\$22,614,177	\$6,369,136	\$5,189,581	\$317,326	\$5,095,843	\$68,895	\$605,261
GEOGRAPHIC DIVISIONS:										
New England.....	72	2,897,256	2,827,024	1,507,816	797,305	269,715	22,278	229,910	14,631	55,601
Middle Atlantic.....	123	2,233,268	2,204,204	1,220,117	274,244	297,246	16,544	396,053	3,425	26,629
East North Central.....	567	12,631,617	12,430,269	5,785,685	2,216,564	2,743,353	42,350	1,642,317	36,251	165,097
West North Central.....	760	8,608,144	8,375,659	5,375,607	1,175,518	759,475	119,939	945,120	5,845	221,640
South Atlantic.....	330	4,774,884	4,736,670	2,848,289	691,596	325,523	7,890	863,372	1,843	36,371
East South Central.....	154	1,766,761	1,750,064	1,047,116	190,481	167,475	7,574	337,418	440	16,257
West South Central.....	191	2,567,432	2,552,137	1,678,627	210,258	52,978	51,474	558,800	325	14,970
Mountain.....	73	889,147	859,944	601,179	119,337	50,546	6,440	82,442	906	28,297
Pacific.....	48	3,896,710	3,850,092	2,549,741	693,833	523,270	42,837	40,411	5,229	41,389
NEW ENGLAND:										
Maine.....	6	133,849	128,055	27,122	3,870	52,101	450	44,512	.....	5,794
New Hampshire.....	4	39,781	39,200	27,026	3,600	6,774	.....	1,800	.....	581
Vermont.....	16	244,237	224,661	147,049	26,483	32,564	10,471	8,094	.....	19,576
Massachusetts.....	39	2,057,671	2,028,289	1,063,207	626,277	138,548	11,357	168,900	9,692	19,660
Rhode Island.....	1	11,879	11,879	7,779	.....	863	.....	3,237	.....	.....
Connecticut.....	6	409,839	394,940	215,633	137,075	38,865	.....	3,367	4,939	9,900
MIDDLE ATLANTIC:										
New York.....	55	971,486	956,107	609,365	129,398	147,684	1,264	68,396	3,425	11,964
New Jersey.....	16	293,507	290,230	143,088	33,963	54,886	.....	58,343	.....	3,277
Pennsylvania.....	52	968,275	957,867	467,714	110,883	94,676	15,280	269,314	.....	10,408
EAST NORTH CENTRAL:										
Ohio.....	149	3,117,404	3,064,095	1,704,103	556,421	413,476	1,200	388,895	13,759	39,550
Indiana.....	90	2,245,724	2,191,279	1,394,490	384,092	274,503	24,036	114,158	2,335	52,110
Illinois.....	121	3,768,183	3,721,978	1,756,987	848,274	1,643,474	2,147	471,096	19,803	26,402
Michigan.....	109	2,806,279	2,284,250	1,152,582	249,204	242,604	2,134	637,726	.....	22,029
Wisconsin.....	98	1,194,027	1,168,667	777,523	178,573	169,296	12,833	30,442	354	26,006
WEST NORTH CENTRAL:										
Minnesota.....	133	1,940,504	1,846,680	1,250,783	286,470	181,867	13,539	114,021	826	92,995
Iowa.....	143	1,476,384	1,434,606	1,018,091	152,864	129,728	31,609	102,263	3,135	38,644
Missouri.....	87	1,352,833	1,336,993	760,147	127,813	37,024	24,548	387,461	264	15,576
North Dakota.....	26	215,000	206,465	142,995	29,641	30,164	.....	3,665	.....	6,585
South Dakota.....	36	373,574	365,639	252,682	30,658	21,543	3,263	57,493	.....	7,365
Nebraska.....	149	1,240,687	1,221,677	808,369	156,513	128,870	13,138	119,787	.....	19,010
Kansas.....	186	2,004,162	1,963,600	1,147,540	391,529	230,279	33,842	160,410	1,620	38,942
SOUTH ATLANTIC:										
Delaware, District of Columbia, and Maryland.....	16	241,984	241,982	152,363	36,168	16,062	1,351	36,088	.....	2
Virginia.....	24	440,454	437,080	209,518	77,577	100,427	.....	49,558	.....	3,374
West Virginia.....	9	114,271	114,271	16,608	120	1,732	.....	95,811	.....	.....
North Carolina.....	80	1,107,810	1,086,284	716,628	146,676	62,928	440	159,612	780	20,806
South Carolina.....	41	428,103	424,275	275,607	38,366	18,173	.....	92,129	997	2,881
Georgia.....	128	1,395,204	1,387,364	801,862	193,227	35,567	6,099	350,609	.....	7,840
Florida.....	32	1,046,998	1,045,414	675,703	199,462	90,634	.....	79,615	66	1,518
EAST SOUTH CENTRAL:										
Kentucky.....	22	323,491	321,491	167,375	56,564	2,600	7,574	87,378	.....	2,000
Tennessee.....	36	522,681	519,456	266,254	57,026	110,926	.....	95,250	440	4,785
Alabama.....	45	384,936	384,248	260,813	38,554	25,803	.....	59,078	.....	688
Mississippi.....	51	535,653	524,869	362,674	38,387	28,146	.....	95,712	.....	10,784
WEST SOUTH CENTRAL:										
Arkansas.....	25	383,010	381,022	249,580	31,554	5,356	.....	94,532	.....	1,988
Louisiana.....	36	587,688	582,207	376,752	58,845	41,280	41,303	64,020	.....	5,498
Oklahoma.....	106	988,022	934,157	651,641	49,504	3,750	6,040	223,222	.....	3,865
Texas.....	24	658,712	654,758	400,654	70,355	2,592	4,131	177,026	326	3,629
MOUNTAIN:										
Montana.....	6	168,829	155,455	107,688	28,787	10,400	.....	8,600	.....	13,374
Idaho.....	8	152,372	150,824	116,620	10,877	2,987	.....	20,340	.....	1,548
Wyoming.....	12	52,222	51,769	41,034	2,896	3,420	.....	4,409	399	64
Colorado.....	16	174,832	168,488	105,572	36,550	19,725	477	6,164	260	6,064
New Mexico.....	4	73,699	72,639	43,334	6,754	2,640	.....	19,911	.....	1,060
Arizona.....	4	39,861	37,309	19,409	10,853	1,888	4,839	320	.....	2,552
Utah.....	22	211,336	208,429	157,402	18,936	8,269	1,124	22,698	247	2,660
Nevada.....	1	15,996	15,041	10,120	3,704	1,217	.....	.....	.....	966
PACIFIC:										
Washington.....	14	2,141,647	2,116,190	1,391,298	386,040	291,640	37,437	9,780	780	24,677
Oregon.....	15	211,189	211,139	139,626	35,961	26,328	.....	9,324	.....	.....
California.....	19	1,543,924	1,522,763	1,018,922	271,832	205,302	5,400	21,307	4,449	16,712

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TABLE 104.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—

	DIVISION AND STATE.	Number of stations.	EXPENSES.					
			Aggregate.	Supplies and materials for ordinary repairs and salaries and wages.	Fuel.	Electric current and electric power purchased.	Rent of offices, stations, line-wire supports, conduits, underground and water privileges.	All other expenses incident to operation and maintenance.
1	UNITED STATES.....	6,542	\$426,568,307	\$121,584,145	\$87,272,088	\$38,818,430	\$9,978,834	\$26,777,645
2	GEOGRAPHIC DIVISIONS:							
3	New England.....	383	41,955,716	11,620,897	8,561,287	5,422,171	835,932	3,230,397
4	Middle Atlantic.....	679	128,892,433	39,204,050	27,869,061	12,066,998	4,232,666	8,612,552
5	East North Central.....	1,385	98,581,368	27,138,978	25,648,006	6,363,690	2,688,624	6,406,814
6	West North Central.....	1,730	46,040,300	12,115,749	10,450,544	5,717,411	466,805	2,568,812
7	South Atlantic.....	728	24,559,144	6,741,548	4,644,437	2,477,242	339,437	1,633,509
8	East South Central.....	410	11,911,628	3,650,494	2,059,792	778,401	75,038	414,559
9	West South Central.....	636	15,662,797	4,780,412	3,386,078	1,282,283	211,886	968,786
10	Mountain.....	337	20,549,813	6,090,411	1,545,131	1,486,939	840,604	1,148,870
11	Pacific.....	254	38,415,108	10,511,607	3,107,752	3,235,295	287,852	1,822,346
12	NEW ENGLAND:							
13	Maine.....	93	2,404,786	809,754	57,312	333,315	24,285	112,488
14	New Hampshire.....	59	2,471,441	746,781	341,140	200,007	19,041	142,969
15	Vermont.....	59	1,611,292	461,489	88,162	366,948	34,348	108,171
16	Massachusetts.....	120	22,908,602	6,385,177	4,589,175	2,649,112	308,319	2,237,580
17	Rhode Island.....	9	3,617,656	824,169	1,160,609	647,194	24,902	219,628
18	Connecticut.....	43	8,941,939	2,398,527	2,324,889	1,225,595	425,037	409,541
19	MIDDLE ATLANTIC:							
20	New York.....	332	67,233,033	21,012,162	10,724,411	8,141,792	2,783,762	3,126,381
21	New Jersey.....	63	18,760,138	5,279,946	5,081,144	498,554	279,620	3,306,245
22	Pennsylvania.....	284	42,899,262	12,911,951	12,063,506	3,419,652	1,169,274	2,180,926
23	EAST NORTH CENTRAL:							
24	Ohio.....	335	20,717,691	5,325,044	7,077,282	1,159,872	1,314,944	711,913
25	Indiana.....	237	11,009,764	3,152,086	2,839,852	841,539	64,595	593,470
26	Illinois.....	303	37,921,833	10,178,822	8,739,918	2,469,441	1,079,567	3,287,180
27	Michigan.....	241	19,216,138	5,500,422	5,252,214	453,042	164,187	1,534,540
28	Wisconsin.....	269	9,715,942	2,982,604	1,738,740	1,439,796	65,331	278,711
29	WEST NORTH CENTRAL:							
30	Minnesota.....	255	11,191,974	2,587,848	1,877,056	1,754,862	102,714	830,005
31	Iowa.....	325	8,738,237	2,142,341	1,713,904	811,065	154,214	585,693
32	Missouri.....	293	12,790,587	3,222,834	2,552,184	2,529,062	133,654	543,385
33	North Dakota.....	127	1,647,691	447,012	526,888	42,471	4,904	79,692
34	South Dakota.....	131	1,745,255	524,659	442,329	42,571	13,317	97,511
35	Nebraska.....	297	3,911,923	1,302,585	1,315,626	165,560	29,067	187,655
36	Kansas.....	302	6,014,633	1,888,470	2,022,557	371,790	28,935	244,871
37	SOUTH ATLANTIC:							
38	Delaware, District of Columbia, and Maryland.....	63	7,454,423	1,594,820	1,335,320	759,956	122,154	637,782
39	Virginia.....	94	2,105,918	660,631	319,326	164,695	13,446	73,790
40	West Virginia.....	72	2,975,345	898,466	763,165	260,918	21,007	104,760
41	North Carolina.....	159	4,130,854	1,083,729	852,320	510,711	12,079	251,383
42	South Carolina.....	82	3,509,305	790,320	387,550	492,436	148,058	329,986
43	Georgia.....	176	2,698,730	797,009	490,847	245,084	17,008	121,374
44	Florida.....	82	1,684,569	646,573	495,909	43,442	5,685	114,434
45	EAST SOUTH CENTRAL:							
46	Kentucky.....	125	3,531,547	987,711	689,161	219,927	44,828	134,406
47	Tennessee.....	106	4,436,698	1,565,336	585,492	466,781	13,005	118,544
48	Alabama.....	82	2,895,713	731,235	415,760	83,307	13,396	99,764
49	Mississippi.....	97	1,047,670	366,202	369,379	3,386	3,809	61,845
50	WEST SOUTH CENTRAL:							
51	Arkansas.....	96	1,450,358	436,484	395,784	54,443	8,362	75,794
52	Louisiana.....	85	2,459,868	745,091	298,856	586,651	8,402	89,033
53	Oklahoma.....	201	3,540,643	1,112,402	834,404	245,107	67,840	203,634
54	Texas.....	254	8,211,928	2,486,435	1,857,034	396,082	127,282	570,325
55	MOUNTAIN:							
56	Montana.....	60	5,474,003	1,187,911	165,284	641,908	172,969	198,365
57	Idaho.....	46	1,947,657	656,198	7,954	129,729	56,992	150,610
58	Wyoming.....	43	894,375	374,375	217,346	9,632	7,786	52,953
59	Colorado.....	69	4,960,727	1,617,571	575,339	374,673	63,568	283,162
60	New Mexico.....	29	839,575	290,323	228,533	18,067	4,022	55,621
61	Arizona.....	29	1,752,154	569,682	289,342	221,655	8,369	111,213
62	Utah.....	47	4,018,963	1,183,536	22,617	51,236	489,983	236,741
63	Nevada.....	14	662,359	210,815	38,716	40,039	36,915	60,205
64	PACIFIC:							
65	Washington.....	88	3,433,747	1,404,008	200,042	153,246	21,276	151,988
66	Oregon.....	68	2,276,169	725,738	143,679	124,504	22,805	115,101
67	California.....	98	32,705,192	8,381,861	2,764,031	2,957,545	243,771	1,556,257

GENERAL TABLES.

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EXPENSES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

EXPENSES—continued.										
Taxes.						Interest on funded and floating debt and mortgages.	Injuries and damages and legal expenses.	Insurance.	Charges for depreciation.	Charges for sinking fund.
Total.	Real and personal property.	Capital stock.	Federal corporation.	Earnings.	Miscel- laneous.					
\$30,062,062	\$15,585,614	\$1,307,378	\$4,603,232	\$5,133,526	\$3,433,212	\$73,584,279	\$1,697,391	\$3,783,065	\$28,307,104	\$4,702,364
3,483,709	2,453,341	339,060	287,331	276,616	127,361	4,154,624	99,369	614,770	3,532,690	399,870
10,075,458	3,522,457	608,059	2,396,486	1,197,984	2,350,472	18,363,533	377,037	1,107,544	5,614,211	1,375,324
6,889,224	4,466,077	124,194	931,063	1,166,536	201,354	13,188,931	404,079	899,281	8,018,290	936,451
2,059,305	1,346,057	33,520	215,541	343,034	121,153	8,984,716	198,134	399,596	2,783,066	296,162
1,352,254	845,134	96,977	165,864	179,449	64,830	5,001,702	133,828	175,048	2,084,700	245,439
679,116	546,480	9,116	27,918	70,100	25,502	3,612,966	52,037	114,647	343,450	136,138
1,130,146	758,825	16,901	119,244	38,975	196,201	2,712,139	115,062	171,759	883,191	51,055
1,833,786	1,305,007	44,371	131,511	92,224	260,673	5,897,864	116,142	127,941	1,214,131	247,994
2,559,964	342,236	35,180	328,274	1,768,608	85,666	11,667,804	201,703	172,479	3,833,375	1,013,931
148,891	130,968	2,978	11,414	1,832	1,699	666,723	8,706	29,934	201,107	12,271
231,457	199,347	5,590	18,951	6,701	898	504,650	10,288	32,169	210,348	32,571
74,940	57,734	1,263	4,852	8,676	2,415	368,497	11,751	31,543	56,453	8,990
2,369,357	1,703,298	298,359	145,393	121,151	101,158	1,760,005	16,474	428,035	1,899,523	295,845
225,019	111,897	10,040	40,373	44,272	18,437	271,388	10,505	38,630	193,258	2,354
434,045	250,097	20,830	66,348	93,984	2,786	583,361	41,645	54,459	1,002,001	47,839
6,276,739	2,655,580	75,777	986,830	509,939	2,048,613	9,838,339	154,190	786,461	3,316,077	1,072,719
1,556,584	684,082	1,209	594,849	259,484	16,960	1,568,426	63,771	82,717	1,007,809	35,322
2,242,135	182,795	531,073	814,807	428,561	284,899	6,956,768	159,076	238,366	1,290,325	267,283
1,470,093	984,227	14,540	128,777	265,041	77,508	2,078,310	103,822	129,053	1,143,989	203,369
577,668	403,372	11,125	44,887	27,535	90,749	1,920,294	25,488	113,453	760,168	121,161
2,797,498	1,392,981	58,275	461,465	861,809	22,968	5,102,158	158,690	445,613	3,650,400	12,546
1,396,636	1,094,693	33,552	247,606	7,670	3,115	2,647,725	71,028	147,669	1,607,287	451,388
657,329	590,804	6,702	48,328	4,481	7,014	1,440,454	45,051	63,493	856,446	147,987
539,845	375,614	3,442	72,672	82,041	6,076	2,479,050	30,473	83,288	758,870	147,963
344,892	254,638	5,045	68,432	3,961	12,816	2,310,063	26,724	80,717	550,837	17,757
701,234	374,587	13,513	27,928	195,535	89,671	2,016,455	84,528	89,980	865,236	52,035
56,755	42,932	1,459	6,745	5,248	371	369,633	1,728	24,274	83,001	11,333
55,937	46,136	966	6,687	710	1,438	388,600	3,647	22,426	143,222	11,036
203,076	138,415	2,209	19,841	41,338	1,273	521,096	10,178	32,675	142,355	2,050
157,566	113,735	6,886	13,236	14,201	9,508	899,849	40,866	66,236	239,515	53,988
559,909	220,473	75,342	109,098	140,539	14,457	1,599,711	41,411	25,329	658,335	119,696
91,893	76,642	1,105	4,806	3,598	5,742	652,871	4,350	22,644	101,840	432
180,040	115,658	3,491	13,713	15,227	11,951	548,907	8,799	27,543	170,735	11,005
130,262	100,192	4,587	5,203	9,177	12,103	723,685	35,893	30,029	468,125	31,638
252,687	200,749	9,127	26,692	3,546	12,573	536,479	32,442	26,754	490,981	31,612
116,160	101,122	2,139	3,653	2,664	6,582	751,495	7,235	24,742	95,038	32,738
40,303	30,298	1,186	2,699	4,698	1,422	188,534	3,698	18,007	109,646	18,318
334,110	250,821	4,904	15,699	49,865	12,821	909,299	12,486	43,190	145,692	10,737
234,539	208,224	3,414	8,606	6,602	7,693	1,248,773	10,094	27,392	153,577	13,166
73,561	53,047	584	3,111	12,915	3,904	1,291,985	16,503	33,253	28,751	108,198
36,936	34,388	214	502	718	1,084	162,909	12,954	10,812	15,430	4,038
71,286	57,580	1,482	2,457	1,820	7,947	314,172	3,888	21,104	53,457	15,584
225,606	110,028	2,607	13,326	6,373	93,272	422,795	12,116	18,873	51,617	828
231,114	192,336	3,933	24,478	8,694	1,673	656,740	17,797	52,983	136,054	2,568
602,140	398,881	8,879	78,983	22,088	93,309	1,338,432	81,261	78,799	642,063	32,075
600,249	294,034	31,738	33,465	39,973	201,039	2,024,563	23,003	17,499	438,060	4,192
223,170	203,203	1,203	1,710	13,112	3,942	568,989	15,253	17,471	42,229	79,062
29,275	22,089	566	3,844	2,257	519	116,186	489	6,851	68,647	10,835
435,219	362,136	5,285	22,781	16,280	28,737	1,161,470	18,845	39,561	271,889	119,430
25,924	21,768	108	650	2,493	905	142,124	1,142	11,913	57,006	4,900
95,107	71,129	683	8,579	13,666	1,050	282,010	8,318	20,601	130,263	15,594
361,811	277,687	3,432	56,521	2,844	21,327	1,432,792	46,160	7,670	172,436	13,981
63,031	52,961	1,356	3,961	1,599	3,154	169,730	2,932	6,375	33,601	.....
166,980	116,523	1,741	14,396	2,453	31,867	910,350	7,077	8,547	398,052	12,181
188,848	157,555	2,414	24,128	930	3,821	655,703	8,617	29,283	247,743	14,148
2,204,136	68,158	31,025	289,750	1,765,225	49,978	10,101,751	186,009	134,649	3,187,580	987,602

TABLE 105.—COMMERCIAL CENTRAL ELECTRIC STATIONS—

	DIVISION AND STATE.	Number of stations.	EXPENSES.					
			Aggregate.	Supplies and materials for ordinary repairs and salaries and wages.	Fuel.	Electric current and electric power purchased.	Rent of offices, stations, line-wire supports, conduits, underground and water privileges.	All other expenses incident to operation and maintenance.
1	UNITED STATES.....	4,224	\$305,127,395	\$108,691,979	\$78,286,011	\$35,733,235	\$9,881,211	\$25,899,343
2	GEOGRAPHIC DIVISIONS:							
3	New England.....	311	39,537,952	10,786,973	7,968,902	5,043,490	829,462	3,112,368
4	Middle Atlantic.....	566	127,064,164	38,428,895	27,328,957	11,874,771	4,227,776	8,545,199
5	East North Central.....	518	88,064,469	22,637,387	22,661,962	5,353,771	2,652,140	6,218,964
6	West North Central.....	970	39,199,247	9,466,169	8,013,398	5,081,566	452,975	2,362,019
7	South Atlantic.....	398	21,345,115	5,256,262	3,676,480	2,023,990	331,046	1,537,408
8	East South Central.....	256	10,570,938	3,093,993	1,563,000	733,071	72,628	384,752
9	West South Central.....	445	13,815,792	3,986,584	2,774,401	1,200,319	209,307	847,607
10	Mountain.....	264	19,909,268	5,809,938	1,416,716	1,414,385	830,122	1,130,307
	Pacific.....	206	35,620,450	9,225,778	2,887,195	3,007,872	275,755	1,760,749
11	NEW ENGLAND:							
12	Maine.....	87	2,330,279	758,728	53,886	324,468	24,129	108,061
13	New Hampshire.....	55	2,442,278	735,981	332,730	199,201	18,604	141,868
14	Vermont.....	43	1,418,204	383,576	56,320	348,060	33,673	95,924
15	Massachusetts.....	81	21,186,383	5,818,213	4,114,159	2,351,848	304,347	2,162,234
16	Rhode Island.....	8	3,609,230	821,353	1,160,609	641,829	24,902	219,553
	Connecticut.....	37	8,551,578	2,269,122	2,251,198	1,178,069	423,807	384,728
17	MIDDLE ATLANTIC:							
18	New York.....	277	66,402,356	20,701,773	10,442,556	8,062,605	2,781,491	3,101,604
19	New Jersey.....	47	18,524,519	5,170,961	5,019,326	489,852	279,820	3,236,221
	Pennsylvania.....	232	42,137,289	12,556,171	11,862,075	3,332,814	1,166,965	2,150,344
20	EAST NORTH CENTRAL:							
21	Ohio.....	186	18,014,604	4,425,898	6,085,849	1,020,839	1,296,470	678,691
22	Indiana.....	147	9,305,534	2,512,201	2,228,590	700,752	60,257	554,359
23	Illinois.....	182	34,739,341	8,396,168	8,296,638	1,950,276	1,073,862	3,237,640
24	Michigan.....	132	17,246,579	4,652,199	4,571,608	372,434	161,127	1,491,200
	Wisconsin.....	171	8,758,411	2,650,921	1,469,277	1,309,470	60,424	257,074
25	WEST NORTH CENTRAL:							
26	Minnesota.....	122	9,680,720	2,069,226	1,338,334	1,544,341	99,235	780,345
27	Iowa.....	182	7,505,041	1,622,207	1,287,790	681,396	150,788	551,998
28	Missouri.....	206	11,800,634	2,814,010	2,150,361	2,485,096	130,591	505,719
29	North Dakota.....	101	1,469,888	383,549	464,833	18,921	4,892	71,093
30	South Dakota.....	95	1,444,674	408,309	318,643	28,731	12,657	65,104
31	Nebraska.....	148	2,850,274	939,343	964,081	55,052	28,424	165,684
	Kansas.....	116	4,348,016	1,229,525	1,489,356	268,029	26,488	202,076
32	SOUTH ATLANTIC:							
33	Delaware, District of Columbia, and Maryland.....	47	7,244,998	1,524,289	1,240,797	753,089	120,035	629,868
34	Virginia.....	70	1,794,729	539,365	252,294	147,560	10,647	63,032
35	West Virginia.....	63	2,879,863	849,394	740,938	260,749	20,787	90,156
36	North Carolina.....	79	3,369,498	838,937	640,592	337,460	11,323	231,254
37	South Carolina.....	41	3,217,644	683,453	307,332	431,833	147,661	324,377
38	Georgia.....	48	1,784,400	457,280	216,060	66,754	16,040	105,061
	Florida.....	50	1,053,983	363,544	278,467	26,545	4,553	93,660
39	EAST SOUTH CENTRAL:							
40	Kentucky.....	103	3,307,132	877,911	596,367	218,980	44,187	128,761
41	Tennessee.....	70	3,998,260	1,387,582	429,813	462,681	11,609	109,716
42	Alabama.....	37	2,614,935	618,883	324,739	51,460	13,264	96,163
	Mississippi.....	46	650,611	209,617	218,081		3,568	50,112
43	WEST SOUTH CENTRAL:							
44	Arkansas.....	71	1,195,957	340,488	307,283	41,561	7,113	62,045
45	Louisiana.....	49	2,082,059	570,544	158,879	583,467	8,266	72,046
46	Oklahoma.....	95	2,806,192	810,584	566,316	233,605	67,374	186,371
	Texas.....	230	7,731,584	2,264,968	1,741,923	341,686	126,554	527,145
47	MOUNTAIN:							
48	Montana.....	54	5,348,998	1,141,415	116,480	641,908	172,969	193,455
49	Idaho.....	38	1,852,044	614,037	6,877	101,553	56,886	146,390
50	Wyoming.....	31	852,013	353,758	204,216	6,325	7,786	51,790
51	Colorado.....	53	4,832,515	1,567,972	535,877	368,493	53,945	280,521
52	New Mexico.....	25	787,707	269,461	212,364	18,067	3,902	54,496
53	Arizona.....	25	1,720,792	560,530	284,879	208,510	7,843	111,027
54	Utah.....	25	3,864,119	1,095,924	17,307	35,743	489,876	232,575
	Nevada.....	13	651,080	206,841	38,716	33,786	36,915	60,053
55	PACIFIC:							
56	Washington.....	74	1,877,867	571,798	88,105	107,115	16,049	119,360
57	Oregon.....	53	2,117,820	661,435	134,760	103,953	18,005	111,093
	California.....	79	31,624,763	7,992,545	2,664,330	2,796,804	241,701	1,580,296

GENERAL TABLES.

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EXPENSES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

EXPENSES—continued.										
Taxes.						Interest on funded and floating debt and mortgages.	Injuries and damages and legal expenses.	Insurance.	Charges for depreciation.	Charges for sinking fund.
Total.	Real and personal property.	Capital stock.	Federal corporation.	Earnings.	Miscel- laneous.					
\$29,897,106	\$15,468,451	\$1,307,378	\$4,603,232	\$5,119,929	\$3,398,116	\$71,144,843	\$1,625,696	\$3,518,745	\$26,292,284	\$4,156,942
3,480,655	2,450,345	339,080	287,331	276,616	127,303	3,973,262	98,929	576,283	3,297,542	370,086
10,072,192	3,520,855	608,059	2,396,486	1,197,984	2,348,908	18,261,025	376,415	1,085,615	5,509,522	1,358,827
6,773,267	4,863,717	124,194	931,063	1,152,939	201,354	12,433,098	365,152	837,664	7,261,418	819,646
2,068,553	1,345,305	33,520	215,541	348,034	121,153	8,500,211	191,715	325,150	2,532,069	215,422
1,346,069	839,077	96,977	165,864	179,449	54,732	4,717,052	129,070	153,079	1,942,676	231,953
677,469	546,178	9,116	27,918	70,100	24,157	3,484,743	43,974	100,644	284,664	132,100
1,129,531	788,775	16,901	119,244	38,975	195,936	2,514,428	110,857	151,601	845,627	45,230
1,833,238	1,304,459	44,371	131,511	92,224	260,673	5,834,017	112,830	122,500	1,176,206	229,009
2,526,802	339,740	35,180	328,274	1,768,608	54,000	11,377,007	196,754	166,209	3,442,660	754,669
148,788	130,865	2,978	11,414	1,832	1,699	662,954	8,706	29,284	199,009	12,271
231,457	199,347	5,590	18,951	6,701	868	497,886	10,288	31,344	210,348	32,571
72,466	55,260	1,263	4,852	8,676	2,415	334,735	11,626	27,279	46,555	7,990
2,368,921	1,702,920	298,359	145,393	121,151	101,098	1,667,344	16,159	401,314	1,700,896	280,948
224,978	111,856	10,040	40,373	44,272	18,437	271,288	10,505	38,601	193,258	2,354
434,045	250,097	20,830	66,348	93,984	2,786	539,055	41,645	48,461	947,476	23,952
6,274,979	2,654,032	75,777	996,830	509,939	2,048,401	9,805,118	153,590	773,146	3,250,307	1,065,187
1,556,584	684,063	1,209	594,849	259,484	16,900	1,547,428	63,799	79,539	992,792	32,237
2,240,629	182,741	531,073	814,807	428,561	283,447	6,908,479	159,056	232,930	1,266,423	261,403
1,391,439	919,170	14,540	128,777	251,444	77,506	1,770,885	87,543	120,271	950,351	176,368
566,751	392,455	11,125	44,887	27,535	90,749	1,888,207	24,867	96,456	615,964	57,130
2,782,770	1,378,253	58,275	461,465	861,809	22,968	4,911,452	142,145	436,479	3,600,365	11,546
1,381,050	1,089,107	33,552	247,606	7,670	3,115	2,523,292	67,373	129,078	1,448,330	448,888
651,257	584,732	6,702	48,328	4,481	7,014	1,389,262	43,224	55,380	746,408	126,714
539,794	375,563	3,442	72,372	82,041	6,076	2,385,192	28,150	64,257	707,462	124,384
344,853	254,599	5,045	68,432	2,961	12,816	2,287,499	26,117	70,403	514,263	17,757
701,234	374,587	13,513	27,928	196,535	89,671	1,973,651	82,463	79,005	829,569	48,935
56,742	43,919	1,459	6,745	5,248	3,371	339,242	1,728	21,854	78,001	9,033
55,808	46,007	966	6,087	710	1,438	365,647	3,647	19,353	137,089	9,786
203,076	138,415	2,209	19,841	41,338	1,273	451,900	9,753	23,785	106,026	1,250
157,046	112,215	6,886	13,236	14,201	9,506	727,210	39,857	46,493	157,659	4,277
559,685	220,249	75,342	109,096	140,539	14,457	1,596,690	41,160	23,589	646,100	119,696
87,074	71,828	1,105	4,806	3,598	5,742	592,105	4,177	21,066	76,977	432
159,539	115,172	3,491	13,713	15,227	11,936	547,312	8,799	27,072	164,112	11,005
130,961	99,974	4,587	5,203	9,177	12,020	641,607	32,743	26,475	448,006	30,140
252,537	200,599	9,127	26,092	3,546	12,573	510,605	32,424	22,734	473,701	30,987
116,180	101,122	2,139	3,653	2,664	6,582	682,636	7,116	16,265	72,027	29,001
40,143	30,138	1,186	2,699	4,696	1,422	156,097	2,651	15,878	61,753	10,692
334,075	250,786	4,904	15,699	49,865	12,821	904,291	11,432	41,249	139,192	10,737
233,194	208,224	3,414	8,606	6,602	6,348	1,214,154	9,594	21,911	110,841	13,165
73,294	52,780	584	3,111	12,915	3,904	1,259,462	16,508	31,468	21,501	108,198
36,906	34,388	214	502	718	1,084	106,536	6,445	6,016	13,030	.....
70,990	57,530	1,482	2,457	1,820	7,707	295,619	3,888	18,715	36,969	11,280
225,606	110,028	2,607	13,326	6,373	93,272	389,716	12,116	15,294	45,297	828
231,114	192,336	3,933	24,478	8,694	1,673	512,998	16,837	46,162	132,263	2,568
602,115	398,881	8,879	78,983	22,088	93,284	1,316,095	78,016	71,430	631,098	30,554
600,249	294,034	31,738	33,465	39,973	201,039	2,019,235	20,930	15,235	423,730	3,392
223,170	203,203	1,203	1,710	13,112	3,942	554,319	15,253	16,872	41,160	75,527
29,275	22,069	566	3,844	2,257	519	113,832	489	6,560	66,647	9,335
435,219	362,136	5,285	22,781	16,280	28,737	1,155,997	18,606	38,901	262,304	114,680
25,924	21,768	108	650	2,493	905	134,728	942	11,168	51,755	4,900
94,559	70,581	683	8,579	13,666	1,060	280,163	8,318	20,412	128,957	15,594
361,811	277,687	3,432	56,521	2,844	21,327	1,406,913	45,360	6,977	166,052	5,561
63,031	52,961	1,366	3,961	1,569	3,154	168,830	2,932	6,375	33,601	.....
135,314	116,528	1,741	14,396	2,453	201	682,569	4,896	6,884	133,596	12,181
188,848	157,555	2,414	24,128	930	3,821	633,261	8,417	27,453	225,207	5,388
2,201,640	65,662	31,025	289,750	1,765,225	49,978	10,061,177	183,441	131,872	3,063,857	737,100

TABLE 106.—MUNICIPAL CENTRAL ELECTRIC STATIONS—EXPENSES, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Num- ber of sta- tions.	EXPENSES.										Charges for depre- ciation.	Charges for sinking fund.		
		Aggregate.	Supplies and materials for ordinary repairs and salaries and wages.	Fuel.	Electric current and elec- tricity power chased.	Rent of offices, stations, line- wire supports, condensers, underground and water privileges.	All other expenses incident to oper- ation and main- tenance.	Taxes.		Interest on funded and float- ing debt and mortgages.	Injuries and damages and legal expenses.			Insurance.	
								Total.	Real and personal prop- erty.	Miscel- laneous.					
UNITED STATES.....	2,318	\$31,440,912	\$12,892,166	\$3,986,077	\$3,085,195	\$97,623	\$878,302	\$165,866	\$117,163	\$48,663	\$2,439,436	\$71,666	\$24,320	\$545,422	
GEOGRAPHIC DIVISIONS:															
New England.....	72	2,417,764	533,924	592,335	378,661	6,470	118,029	3,054	2,996	58	181,363	440	38,457	29,784	
Middle Atlantic.....	123	1,528,269	775,164	645,104	185,227	4,860	68,353	3,266	1,602	1,664	102,608	622	21,929	16,497	
East North Central.....	567	10,516,899	4,501,591	2,985,044	1,089,919	38,464	186,860	115,957	102,360	13,597	705,833	38,927	61,617	116,806	
West North Central.....	760	6,841,053	2,649,580	2,437,146	635,945	13,830	206,793	6,155	752	98	494,505	6,419	74,446	80,740	
South Atlantic.....	330	3,214,029	1,215,286	967,967	453,252	8,391	96,101	1,847	6,057	98	284,660	4,758	21,969	142,024	
East South Central.....	154	1,340,660	496,792	496,792	40,330	2,410	28,807	1,647	8,302	1,345	128,223	8,063	14,003	68,896	
West South Central.....	191	1,847,035	783,828	611,077	81,994	2,679	91,179	3,315	50	265	197,711	4,205	20,158	6,826	
Mountain.....	72	1,640,545	280,473	128,415	72,554	10,432	18,663	548	548	31,666	63,847	3,312	37,925	15,985	
Pacific.....	48	2,794,653	1,285,539	220,557	227,423	12,097	62,597	34,163	2,496	31,666	290,797	4,949	6,270	295,262	
NEW ENGLAND:															
Maine.....	6	74,507	51,026	3,426	8,852	156	4,427	103	103	.....	3,796	.....	650	.....	
New Hampshire.....	4	26,163	10,806	8,410	806	437	1,121	.....	.....	.....	6,764	.....	825	.....	
Vermont.....	16	193,068	77,913	31,842	18,988	676	12,247	2,474	2,474	.....	33,702	.....	4,264	1,000	
Massachusetts.....	39	1,722,219	696,964	475,016	297,264	3,972	75,346	436	378	58	92,661	315	26,721	14,897	
Rhode Island.....	1	8,426	2,816	475,016	6,365	.....	75	41	41	.....	29	.....	.....	.....	
Connecticut.....	6	360,361	124,405	73,691	47,006	1,280	24,813	.....	.....	.....	44,306	.....	5,968	13,387	
MIDDLE ATLANTIC:															
New York.....	55	830,677	310,389	281,855	89,187	2,271	24,777	1,700	1,548	212	33,221	600	12,315	65,770	
New Jersey.....	16	235,619	105,965	61,818	9,202	2,309	13,024	1,506	54	1,452	20,968	2	3,178	15,017	
Pennsylvania.....	53	761,973	355,780	201,431	86,538	3,063	30,582	.....	.....	.....	46,289	.....	5,438	23,902	
EAST NORTH CENTRAL:															
Ohio.....	149	2,702,087	899,146	961,433	139,033	18,474	33,222	78,664	65,057	13,597	307,425	16,279	8,783	198,638	
Indiana.....	90	1,704,230	639,885	611,262	140,787	4,338	39,111	10,917	10,917	.....	180,706	621	16,937	144,204	
Illinois.....	121	3,182,493	1,782,654	443,280	519,165	5,705	49,540	14,728	14,728	.....	190,706	16,545	9,134	150,035	
Michigan.....	109	1,969,569	680,608	680,608	180,008	3,060	43,340	5,586	5,586	.....	124,453	3,655	18,591	158,957	
Wisconsin.....	96	1,957,531	331,668	299,463	130,326	4,907	21,637	6,072	6,072	.....	51,192	1,827	8,113	110,038	
WEST NORTH CENTRAL:															
Minnesota.....	133	1,511,254	518,622	538,722	210,521	3,479	49,690	51	51	.....	93,868	2,323	19,031	51,408	
Iowa.....	143	1,238,196	426,114	426,114	126,999	3,026	33,695	29	39	.....	72,594	607	10,314	36,574	
Missouri.....	87	989,953	408,824	401,823	43,966	3,063	37,666	.....	.....	.....	42,804	2,065	10,975	35,867	
North Dakota.....	26	177,803	63,463	62,056	23,560	12	8,599	13	13	.....	10,391	.....	2,420	2,300	
South Dakota.....	36	300,561	116,360	123,696	13,944	760	12,407	129	129	.....	22,963	.....	3,073	1,260	
Nebraska.....	149	961,649	383,242	351,545	110,508	643	21,971	.....	.....	.....	69,266	425	8,800	34,359	
Kansas.....	136	1,066,617	695,945	535,201	103,761	2,447	42,796	520	520	.....	172,639	999	19,743	81,556	
SOUTH ATLANTIC:															
Delaware, District of Co- lumbia, and Maryland.....	16	209,425	70,531	94,523	6,367	2,119	7,914	224	224	.....	13,021	251	1,740	12,235	
Virginia.....	24	311,189	121,266	67,037	17,135	2,799	10,758	4,819	4,819	.....	60,766	173	1,578	24,863	
West Virginia.....	9	95,482	49,072	22,227	17,169	220	14,604	501	496	15	1,565	.....	471	6,623	
North Carolina.....	80	761,356	244,792	211,728	173,251	756	20,129	301	218	83	82,078	3,150	3,554	20,119	
South Carolina.....	41	291,661	106,867	80,218	60,033	397	5,609	150	150	.....	25,874	118	4,020	7,280	
Georgia.....	128	914,330	339,729	274,787	178,330	968	16,313	160	160	.....	68,659	119	8,477	23,011	
Florida.....	32	630,686	283,029	217,442	16,397	1,132	20,774	100	100	.....	32,457	1,047	2,129	47,363	
EAST SOUTH CENTRAL:															
Kentucky.....	22	224,415	109,800	92,794	997	641	5,645	35	35	.....	6,008	1,054	1,941	6,500	
Tennessee.....	36	438,438	177,754	161,679	4,100	1,396	8,828	1,345	1,345	.....	34,619	1,500	5,461	42,736	
Alabama.....	45	280,778	112,353	91,021	31,947	1,132	3,601	267	267	.....	32,533	.....	1,785	7,250	
Mississippi.....	51	397,069	156,585	151,268	3,396	241	11,733	.....	.....	.....	56,073	6,509	4,796	4,038	
WEST SOUTH CENTRAL:															
Arkansas.....	25	254,401	96,996	88,501	12,892	1,249	13,749	200	50	240	18,553	2,390	2,390	16,488	
Louisiana.....	36	377,809	174,547	139,977	3,184	1,136	16,987	.....	.....	.....	33,079	3,679	3,679	6,320	
Oklahoma.....	106	734,451	301,818	268,068	11,502	466	17,263	.....	.....	.....	127,742	980	6,821	3,791	
Texas.....	24	480,344	221,467	115,111	54,366	728	43,180	25	.....	25	22,337	3,245	7,396	10,945	
MOUNTAIN:															
Montana.....	6	125,005	46,496	48,804	28,176	106	4,910	.....	.....	.....	5,326	2,073	2,264	14,330	
Idaho.....	8	96,613	42,161	1,077	3,307	.....	4,220	.....	.....	.....	14,670	.....	599	1,099	
Wyoming.....	12	42,362	20,617	13,130	6,180	.....	1,163	.....	.....	.....	2,354	.....	201	3,535	
Colorado.....	16	128,212	46,599	39,462	9,623	.....	2,641	.....	.....	.....	5,473	239	690	1,500	
New Mexico.....	4	61,868	20,863	16,169	1,126	.....	1,126	.....	.....	.....	7,396	200	745	4,760	
Arizona.....	4	31,362	9,153	4,463	13,145	.....	1,186	.....	.....	.....	1,947	136	136	5,251	
Utah.....	22	154,644	87,612	5,310	15,468	107	4,166	.....	.....	.....	25,870	800	6,394	8,400	
Nevada.....	1	11,279	3,974	.....	6,253	.....	1,162	.....	.....	.....	.....	.....	.....	.....	
PACIFIC:															
Washington.....	14	1,555,890	852,210	111,937	46,121	5,227	32,628	31,666	.....	.....	227,751	2,181	1,963	264,456	
Oregon.....	15	1,158,349	64,303	8,919	20,551	4,800	4,008	.....	.....	.....	23,442	200	1,530	22,536	
California.....	19	1,060,429	399,316	99,701	160,741	2,070	26,961	2,496	2,496	.....	40,571	2,568	2,777	103,723	

ELECTRICAL INDUSTRIES: 1917.

TABLE 107.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—

DIVISION AND STATE.		Number of stations.	PRIMARY POWER.													
			Aggregate.		Total steam.		Steam engines.									
							Total.		500 horsepower or under.		Over 500 horsepower and under 2,000 horsepower.		2,000 horse-power and under 5,000 horse-power.		5,000 horse-power and over.	
Number of units.	Horse-power.	Number of units.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	
UNITED STATES.....		6,542	13,795	12,936,755	7,487	8,449,076	5,788	1,701,677	5,200	906,957	484	454,039	87	233,274	17	107,407
GEOGRAPHIC DIVISIONS:																
New England.....		383	1,108	1,278,181	502	922,819	277	131,302	203	46,654	61	51,772	13	32,966	13	80,300
Middle Atlantic.....		679	1,961	3,468,999	1,219	2,572,627	843	447,523	646	140,753	157	153,610	27	72,860	13	80,300
East North Central.....		1,385	3,024	2,911,630	1,813	2,441,563	1,378	410,114	1,228	220,073	125	126,371	25	63,670	13	80,300
West North Central.....		1,730	3,060	1,100,117	1,393	707,450	1,196	226,588	1,148	184,278	45	35,130	3	7,180	13	80,300
South Atlantic.....		728	1,232	1,104,746	754	552,899	628	136,451	602	98,046	20	18,405	5	13,000	1	7,000
East South Central.....		410	744	516,745	545	277,222	480	79,592	466	68,012	14	11,580	1	1,580	1	7,000
West South Central.....		636	1,251	340,530	745	286,377	644	134,907	608	93,757	32	30,350	4	10,800	1	7,000
Mountain.....		337	782	802,094	297	172,023	220	59,548	198	35,199	18	16,308	3	8,043	1	7,000
Pacific.....		254	633	1,413,713	219	516,087	122	75,562	100	20,185	12	10,515	7	24,755	3	20,107
NEW ENGLAND:																
Maine.....		93	251	98,248	52	22,478	44	12,295	38	7,845	6	4,450	1	2,666	1	2,666
New Hampshire.....		59	162	93,331	46	34,794	32	14,769	24	5,237	7	6,866	1	2,666	1	2,666
Vermont.....		50	142	73,760	32	17,285	22	6,010	21	5,260	1	750	1	750	1	750
Massachusetts.....		120	349	681,685	239	555,212	126	82,263	76	19,237	38	32,726	12	30,300	1	7,000
Rhode Island.....		9	45	135,871	23	131,008	9	5,275	3	625	6	4,750	1	750	1	750
Connecticut.....		43	159	195,286	110	162,042	44	10,780	41	8,550	3	2,230	1	750	1	750
MIDDLE ATLANTIC:																
New York.....		332	967	1,811,066	496	1,103,170	352	204,322	288	51,782	37	32,380	14	36,880	13	80,300
New Jersey.....		63	227	367,743	189	362,871	129	72,581	81	20,091	41	36,990	7	15,500	1	7,000
Pennsylvania.....		284	747	1,290,190	534	1,106,586	362	170,620	277	68,880	79	84,240	6	17,500	1	7,000
EAST NORTH CENTRAL:																
Ohio.....		335	579	583,341	427	557,717	327	102,851	292	55,399	30	30,602	5	16,780	1	7,000
Indiana.....		237	487	301,150	351	270,219	264	66,252	243	46,186	20	16,066	1	4,000	1	7,000
Illinois.....		303	712	1,046,386	508	982,740	388	138,762	333	58,992	38	41,020	17	38,750	1	7,000
Michigan.....		241	661	612,642	270	411,353	196	50,214	177	31,228	17	14,828	2	4,160	1	7,000
Wisconsin.....		269	585	368,111	262	219,534	203	52,035	183	28,268	20	23,767	1	7,000	1	7,000
WEST NORTH CENTRAL:																
Minnesota.....		255	488	228,241	250	119,001	210	36,321	205	31,671	5	4,650	1	7,000	1	7,000
Iowa.....		325	515	263,804	265	90,675	231	47,610	220	38,030	11	9,580	1	7,000	1	7,000
Missouri.....		293	495	225,910	309	199,950	274	53,702	259	40,212	13	8,990	2	4,500	1	7,000
North Dakota.....		127	274	29,079	117	24,679	112	18,904	108	16,119	4	2,785	1	7,000	1	7,000
South Dakota.....		131	246	33,126	57	16,150	50	7,450	50	7,450	5	7,450	1	7,000	1	7,000
Nebraska.....		297	524	112,103	186	89,119	156	25,062	152	23,062	3	2,000	1	7,000	1	7,000
Kansas.....		302	518	207,854	209	167,885	164	37,539	154	27,734	9	7,125	1	2,680	1	7,000
SOUTH ATLANTIC:																
Delaware.....		12	24	4,007	18	3,360	17	2,510	17	2,510	1	750	1	750	1	750
Maryland.....		50	79	99,324	43	95,704	33	22,592	28	4,592	4	11,000	1	7,000	1	7,000
District of Columbia.....		1	11	100,800	11	100,800	5	5,800	5	5,800	1	750	1	750	1	750
Virginia.....		94	180	91,030	88	40,335	64	10,381	63	9,681	1	750	1	750	1	750
West Virginia.....		72	132	130,693	87	116,894	60	16,789	55	11,919	5	4,870	1	750	1	750
North Carolina.....		150	211	231,033	109	61,865	92	15,595	88	12,760	4	2,835	1	750	1	750
South Carolina.....		82	176	263,990	83	33,409	74	12,194	73	11,394	1	800	1	750	1	750
Georgia.....		176	249	125,674	174	50,055	156	26,263	154	23,513	1	750	1	2,000	1	750
Florida.....		82	170	58,195	141	50,477	127	24,327	124	21,677	3	2,650	1	750	1	750
EAST SOUTH CENTRAL:																
Kentucky.....		125	236	98,752	166	96,066	138	22,039	134	19,189	4	2,850	1	750	1	750
Tennessee.....		106	203	201,912	129	69,679	112	18,779	110	16,779	2	2,000	1	750	1	750
Alabama.....		82	146	182,793	120	79,232	110	19,080	105	14,740	5	4,340	1	750	1	750
Mississippi.....		97	159	33,288	130	32,245	120	19,694	117	17,304	3	2,390	1	750	1	750
WEST SOUTH CENTRAL:																
Arkansas.....		96	184	36,599	130	31,498	114	18,849	112	17,549	2	1,300	1	750	1	750
Louisiana.....		85	153	36,005	81	29,248	74	23,406	60	8,116	12	10,490	2	4,800	1	750
Oklahoma.....		201	363	83,097	223	68,869	200	45,709	187	28,699	11	11,010	2	6,000	1	750
Texas.....		254	551	184,829	311	156,762	256	46,943	249	39,393	7	7,550	1	750	1	750
MOUNTAIN:																
Montana.....		60	156	279,004	39	8,684	34	5,974	34	5,974	1	750	1	750	1	750
Idaho.....		46	85	56,422	10	2,650	9	1,800	8	1,150	1	750	1	750	1	750
Wyoming.....		43	93	27,462	58	22,837	36	7,649	35	7,099	1	550	1	550	1	550
Colorado.....		69	174	140,009	105	65,467	77	16,451	69	9,771	8	6,680	1	750	1	750
New Mexico.....		29	66	17,108	37	13,226	27	6,435	25	5,060	2	1,375	1	750	1	750
Arizona.....		29	47	38,662	28	23,870	22	7,970	18	4,370	4	3,600	1	750	1	750
Utah.....		47	127	228,595	15	34,189	11	12,369	6	975	2	3,351	8	8,043	1	750
Nevada.....		14	34	16,832	5	1,100	4	800	4	800	1	750	1	750	1	750
PACIFIC:																
Washington.....		88	132	151,038	46	36,270	26	3,112	26	3,112	3	2,325	2	9,340	1	750
Oregon.....		68	141	68,708	46	27,062	39	18,837	34	7,172	3	2,325	2	9,340	1	750
California.....		98	360	1,193,969	127	452,755	57	59,613	40	9,901	9	8,190	5	15,415	3	20,107

GENERAL TABLES.

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PRIMARY POWER, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

PRIMARY POWER—continued.																							
Steam turbines.										Water wheels and turbines.										Internal-combustion engines.			
Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horse-power.		2,000 horse-power and under 5,000 horsepower.		5,000 horse-power and over.		Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horse-power.		2,000 horse-power and under 5,000 horsepower.		5,000 horse-power and over.					
Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.
1,669	6,747,369	309	90,084	704	734,280	301	925,542	385	4,997,543	3,374	4,277,273	2,148	387,956	731	725,522	232	745,662	268	2,418,133	2,934	210,406	1	
225	791,427	36	9,014	100	108,215	41	127,844	48	546,354	580	349,857	425	93,775	98	85,882	25	80,200	12	90,000	46	5,505	2	
376	2,125,104	42	11,351	134	144,006	85	273,797	115	1,696,951	566	869,833	338	56,517	116	114,906	38	121,760	74	576,700	176	26,489	3	
435	2,031,449	79	26,372	180	192,079	53	160,098	124	1,682,900	758	442,434	542	93,511	165	150,903	41	134,920	10	63,100	453	27,633	4	
197	480,871	46	11,646	92	92,923	32	98,629	27	282,673	296	321,169	218	33,534	50	50,135	9	32,000	19	205,500	1,371	71,489	5	
126	416,448	23	9,175	53	58,333	29	83,740	21	266,200	337	535,970	209	33,012	68	77,608	21	70,450	39	357,900	141	12,577	6	
65	197,630	14	3,902	24	22,198	17	52,800	10	118,730	81	234,893	42	4,659	8	9,834	10	32,900	21	187,500	118	4,680	7	
101	151,470	32	8,925	49	45,228	12	38,292	8	59,025	41	7,261	39	5,761	2	1,500	30	101,150	37	355,200	465	46,892	8	
77	112,475	26	6,007	34	33,244	12	29,713	5	43,511	363	618,595	173	33,974	123	128,271	30	172,282	56	582,233	122	11,476	9	
97	440,525	11	3,642	38	38,055	21	65,629	27	333,199	372	894,211	157	33,213	101	106,483	58	172,282	56	582,233	42	3,415	10	
8	10,183	2	533	3	3,650	3	6,000	-----	-----	192	75,580	158	36,910	32	26,680	-----	-----	2	12,000	7	180	11	
14	20,025	6	2,400	6	4,958	1	4,667	1	8,000	105	57,309	86	15,359	11	9,950	8	32,000	-----	-----	11	1,228	12	
10	11,275	2	625	7	6,650	1	4,000	-----	-----	109	56,425	80	21,611	22	19,214	7	15,600	-----	-----	1	50	13	
113	472,949	12	2,918	48	50,493	23	74,541	30	344,997	93	124,386	55	11,352	21	17,434	10	32,600	7	63,000	17	2,087	14	
14	125,733	3	168	2	2,150	3	9,090	6	114,325	17	3,738	17	3,738	-----	-----	-----	-----	-----	-----	5	1,125	15	
66	151,262	11	2,370	34	40,314	10	29,546	11	79,032	44	32,409	29	4,806	12	12,604	-----	-----	3	15,000	5	835	16	
144	898,848	22	5,211	45	41,056	29	82,708	48	769,873	421	701,948	241	43,448	76	78,040	38	121,760	66	488,700	70	5,948	17	
60	290,290	4	855	30	39,742	11	44,593	15	205,100	12	1,327	12	1,327	-----	-----	-----	-----	-----	-----	26	3,545	18	
172	935,966	16	5,285	59	63,207	45	146,496	52	720,978	133	166,608	85	11,742	40	36,866	-----	-----	8	118,000	80	16,996	19	
100	454,866	16	5,733	35	36,102	14	42,320	35	370,711	33	13,616	25	3,816	8	9,800	-----	-----	-----	-----	119	12,008	20	
87	208,967	21	8,060	45	46,403	6	20,432	15	129,062	90	27,663	86	22,813	4	4,850	-----	-----	-----	-----	46	3,268	21	
115	843,978	19	4,898	35	33,877	18	52,071	43	753,632	90	58,985	81	18,285	2	1,500	7	39,200	-----	-----	119	4,661	22	
74	361,139	10	3,676	33	34,547	12	38,608	19	284,308	314	196,215	175	29,002	114	82,413	23	72,400	2	14,400	77	3,074	23	
59	167,499	13	4,515	32	41,150	2	6,667	12	115,167	231	143,955	175	19,595	37	52,340	18	62,520	1	9,500	92	4,622	24	
40	82,680	9	1,725	20	19,841	8	25,114	3	36,000	90	101,148	51	9,513	35	36,135	-----	-----	4	55,500	148	8,092	25	
34	43,065	8	2,175	20	18,593	4	11,297	2	11,000	92	165,878	73	9,778	2	1,700	2	4,400	15	150,000	158	7,251	26	
25	146,248	4	1,350	17	18,607	6	19,000	8	107,291	12	18,665	7	665	-----	-----	5	18,000	-----	-----	174	7,295	27	
5	5,775	2	575	1	750	2	4,480	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	157	4,400	28	
7	8,700	3	950	1	1,070	3	6,680	-----	-----	11	6,970	4	820	7	6,150	-----	-----	-----	-----	178	10,008	29	
31	64,057	10	1,586	13	12,471	3	8,000	5	42,000	57	10,504	53	5,904	4	4,600	-----	-----	-----	-----	281	12,480	30	
45	130,346	10	3,285	20	21,591	6	19,088	9	86,382	34	18,004	30	6,854	2	1,550	2	9,600	-----	-----	275	21,965	31	
1	850	-----	-----	1	850	-----	-----	-----	-----	5	625	5	625	-----	-----	-----	-----	-----	-----	1	22	32	
10	73,112	-----	-----	2	2,750	5	13,362	3	57,000	19	2,405	19	2,405	-----	-----	-----	-----	-----	-----	17	1,215	33	
6	95,000	-----	-----	-----	-----	6	95,000	-----	-----	70	49,874	52	7,774	11	9,700	3	12,000	4	20,400	22	821	34	
24	29,954	5	2,555	15	16,666	4	10,733	7	22,205	15	6,499	65	599	8	5,900	-----	-----	-----	-----	30	7,300	35	
27	100,105	2	750	11	13,950	7	22,205	7	63,200	15	6,499	65	599	8	5,900	-----	-----	-----	-----	30	7,300	36	
17	46,270	6	1,170	7	6,100	1	4,000	3	35,000	85	168,657	65	11,907	6	6,100	5	18,550	9	132,100	17	511	37	
9	21,215	1	500	5	5,085	2	5,630	1	10,000	80	230,099	23	3,969	29	35,730	9	26,000	19	164,400	13	482	38	
18	23,792	7	3,300	5	4,482	5	11,010	1	5,000	58	75,101	36	5,623	12	16,578	3	11,900	7	41,000	17	518	39	
14	26,150	2	900	7	8,460	5	16,800	-----	-----	5	5,710	2	110	2	3,600	1	2,000	-----	-----	24	2,008	40	
28	74,027	7	2,072	10	9,161	8	27,464	3	35,330	7	385	7	385	-----	-----	-----	-----	-----	-----	63	2,301	41	
17	50,900	5	1,750	3	3,250	5	12,500	4	33,400	56	181,652	30	3,618	4	6,534	6	24,000	16	97,800	18	581	42	
10	60,152	-----	-----	6	5,652	1	4,500	3	50,000	18	102,856	5	656	4	3,300	4	8,900	5	90,000	8	705	43	
10	12,551	2	80	5	4,135	3	8,336	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	29	1,043	44	
16	12,649	6	2,000	10	10,649	-----	-----	-----	-----	10	2,540	8	1,040	2	1,500	-----	-----	-----	-----	44	2,561	45	
7	5,842	2	297	5	5,545	-----	-----	-----	-----	5	1,368	5	1,368	-----	-----	-----	-----	-----	-----	72	6,757	46	
23	23,190	9	2,435	11	9,800	3	10,925	-----	-----	5	1,368	5	1,368	-----	-----	-----	-----	-----	-----	135	12,860	47	
55	106,819	15	4,193	23	19,234	9	27,367	8	59,025	26	3,353	26	3,353	-----	-----	-----	-----	-----	-----	214	24,714	48	
5	2,710	2	560	3	2,150	-----	-----	-----	-----	78	268,917	18	3,377	28	30,140	12	43,400	20	192,000	39	1,403	49	
1	750	-----	-----	1	750	-----	-----	-----	-----	71	53,624	37	6,229	31	29,195	-----	-----	3	18,200	4	148	50	
22	15,188	11	3,100	9	8,588	2	3,500	-----	-----	12	2,688	12	2,688	-----	-----	-----	-----	-----	-----	23	1,937	51	
2																							

TABLE 108.—COMMERCIAL CENTRAL ELECTRIC STATIONS—PRIMARY

DIVISION AND STATE.		Number of stations.	PRIMARY POWER.													
			Aggregate.		Total steam.		Steam engines.									
			Number of units.	Horse-power.	Number of units.	Horse-power.	Total.		500 horsepower or under.		Over 500 horsepower and under 2,000 horsepower.		2,000 horsepower and under 5,000 horsepower.		5,000 horsepower and over.	
							Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.
1	UNITED STATES.....	4,224	10,387	12,077,657	5,287	7,852,206	3,799	1,358,691	3,253	593,538	442	424,472	87	233,274	17	107,407
2	GEOGRAPHIC DIVISIONS:															
3	New England.....	311	995	1,222,151	434	878,554	235	120,181	165	38,209	57	49,006	13	32,966		
4	Middle Atlantic.....	556	1,753	3,425,890	1,075	2,538,249	717	424,068	523	119,004	154	151,894	27	72,880	13	80,300
5	East North Central.....	818	2,151	2,641,217	1,172	2,238,061	814	305,117	681	127,751	108	113,696	25	63,670		
6	West North Central.....	970	1,979	945,296	685	583,988	685	141,668	647	106,133	35	28,355	3	7,180		
7	South Atlantic.....	398	816	1,015,953	422	473,383	318	85,688	295	49,318	17	16,370	5	13,000	1	7,000
8	East South Central.....	256	500	471,773	333	234,061	280	48,761	268	38,481	12	10,280				
9	West South Central.....	445	940	296,853	543	251,971	455	107,808	421	67,958	30	29,050	4	10,800		
10	Mountain.....	264	688	785,921	265	166,436	191	54,473	170	30,124	18	16,306	3	8,043		
	Pacific.....	206	565	1,272,613	195	487,512	104	70,937	83	16,560	11	9,515	7	24,755	3	20,107
11	NEW ENGLAND:															
12	Maine.....	87	242	95,810	50	22,003	42	11,820	36	7,370	6	4,450				
13	New Hampshire.....	55	155	91,738	42	33,901	28	13,876	20	4,344	7	6,886	1	2,666		
14	Vermont.....	43	123	66,175	28	15,535	20	5,660	19	4,910	1	750				
15	Massachusetts.....	81	292	643,931	195	519,715	101	74,225	55	13,965	34	29,980	12	30,300		
16	Rhode Island.....	8	45	135,871	23	131,008	9	5,275	3	525	6	4,750				
	Connecticut.....	37	138	188,626	96	156,392	35	9,325	32	7,095	3	2,230				
17	MIDDLE ATLANTIC:															
18	New York.....	277	893	1,792,742	432	1,088,726	296	194,969	233	43,029	36	31,780	14	39,860	13	80,300
19	New Jersey.....	47	199	361,907	175	358,977	117	69,842	70	17,868	40	36,474	7	15,500		
	Pennsylvania.....	232	661	1,271,231	468	1,090,546	304	159,247	220	55,107	78	83,640	6	17,500		
20	EAST NORTH CENTRAL:															
21	Ohio.....	186	370	518,663	265	498,178	182	74,173	153	31,021	24	26,392	5	16,760		
22	Indiana.....	147	363	254,091	237	223,710	170	44,347	155	28,356	14	11,991	1	4,000		
23	Illinois.....	182	532	973,374	363	950,287	258	115,874	206	38,804	35	38,320	17	33,750		
24	Michigan.....	132	459	550,106	142	360,709	92	31,905	75	14,519	15	13,226	2	4,160		
	Wisconsin.....	171	427	344,984	165	206,167	112	38,818	92	15,061	20	23,767				
25	WEST NORTH CENTRAL:															
26	Minnesota.....	122	297	196,584	126	92,225	95	18,130	91	14,060	4	4,050				
27	Iowa.....	182	354	242,533	169	73,561	139	32,870	128	23,290	11	9,580				
28	Missouri.....	206	343	202,382	197	178,551	163	32,753	152	22,263	9	5,990	2	4,500		
29	North Dakota.....	101	233	26,293	101	22,504	96	16,729	92	13,944	4	2,785				
30	South Dakota.....	95	183	27,748	39	13,755	34	5,505	34	5,505						
31	Nebraska.....	148	315	89,746	111	73,079	88	15,382	86	14,132	2	1,250				
	Kansas.....	116	254	160,010	105	130,313	70	20,299	64	12,919	5	4,700	1	2,680		
32	SOUTH ATLANTIC:															
33	Delaware.....	7	12	2,387	6	1,740	5	880	5	880						
34	Maryland.....	39	62	94,749	33	91,564	25	21,202	20	3,202			4	11,000	1	7,000
35	District of Columbia.....	1	11	100,800	11	100,800	5	5,900			5	5,800				
36	Virginia.....	70	142	80,220	71	34,392	52	8,771	51	8,071	1	700				
37	West Virginia.....	63	119	128,631	79	115,239	52	15,134	47	10,264	5	4,870				
38	North Carolina.....	79	133	215,408	50	47,630	41	5,030	40	4,230	1	800				
39	South Carolina.....	41	131	257,617	44	27,273	35	6,068	34	5,258	1	800				
40	Georgia.....	48	98	104,610	40	29,972	22	6,180	20	3,430	1	750	1	2,000		
	Florida.....	50	108	31,531	88	24,773	81	16,623	78	13,973	3	2,650				
41	EAST SOUTH CENTRAL:															
42	Kentucky.....	103	195	87,311	130	84,736	108	16,954	105	14,854	3	2,100				
43	Tennessee.....	70	138	188,964	78	57,391	65	10,941	63	8,941	2	2,000				
44	Alabama.....	37	88	174,638	67	71,742	57	11,590	53	7,800	4	3,790				
	Mississippi.....	46	79	20,880	58	20,192	50	9,276	47	6,886	3	2,390				
45	WEST SOUTH CENTRAL:															
46	Arkansas.....	71	145	29,569	95	25,148	81	13,399	80	12,749	1	650				
47	Louisiana.....	49	88	25,287	49	21,822	45	18,472	32	3,832	11	9,840	2	4,800		
48	Oklahoma.....	95	196	64,893	115	54,744	97	32,949	84	15,939	11	11,010	2	6,000		
	Texas.....	230	511	177,134	284	150,257	232	42,988	225	35,438	7	7,550				
49	MOUNTAIN:															
50	Montana.....	54	144	277,109	32	7,179	27	4,469	27	4,469						
51	Idaho.....	38	79	54,369	10	2,650	9	1,900	8	1,150	1	750				
52	Wyoming.....	31	81	26,741	55	22,517	33	7,329	32	6,779	1	550				
53	Colorado.....	63	152	136,957	92	63,567	65	14,691	57	8,011	8	6,680				
54	New Mexico.....	25	56	15,558	33	12,411	23	5,620	21	4,245	2	1,375				
55	Arizona.....	25	44	38,132	27	23,470	21	7,570	17	3,970	4	3,600				
56	Utah.....	25	98	220,223	11	33,542	9	12,094	4	700	2	3,351	3	8,043		
	Nevada.....	13	34	16,832	5	1,100	4	800	4	800						
57	PACIFIC:															
58	Washington.....	74	116	79,198	44	21,770	26	3,112	26	3,112						
59	Oregon.....	53	120	63,741	42	26,532	35	18,307	30	6,642	3	2,325	2	9,340		
	California.....	79	329	1,129,674	109	439,210	43	49,518	27	6,806	8	7,190	5	15,415	3	20,107

GENERAL TABLES.

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POWER, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

PRIMARY POWER—continued.																					
Steam turbines.										Water wheels and turbines.										Internal-combustion engines.	
Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horse-power.		2,000 horse-power and under 5,000 horse-power.		5,000 horse-power and over.		Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horse-power.		2,000 horse-power and under 5,000 horse-power.		5,000 horse-power and over.			
Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.
1,488	6,493,514	235	68,242	598	630,422	278	854,291	377	4,940,559	3,109	4,076,878	1,922	350,849	709	707,234	226	730,162	252	2,288,633	1,991	148,574
199	758,373	32	7,981	84	94,794	35	109,244	48	546,354	527	339,894	395	86,087	95	83,657	25	80,200	12	90,000	34	3,703
358	2,114,191	35	9,461	123	134,962	85	273,797	118	1,695,961	551	867,787	323	54,421	116	114,906	38	121,760	74	576,700	127	19,844
358	1,932,934	45	15,407	150	161,284	45	140,625	118	1,615,618	676	385,091	473	83,856	161	146,615	39	130,720	3	23,900	303	18,075
163	442,320	33	7,136	75	75,962	29	83,251	26	275,971	275	318,868	197	31,233	50	50,135	9	32,000	19	206,500	866	42,440
104	387,695	19	8,506	38	42,250	26	71,740	21	265,200	302	532,293	178	28,735	64	75,208	21	70,450	39	357,900	92	10,277
53	185,800	12	2,952	15	12,818	16	50,800	10	118,730	74	233,973	35	8,739	8	9,834	10	32,900	21	187,500	93	3,739
88	144,163	25	7,663	43	39,183	12	38,292	8	59,025	37	6,703	35	5,203	2	1,500					360	38,179
74	111,968	23	5,495	34	33,244	12	29,713	5	43,511	332	610,095	145	27,199	120	126,546	30	101,150	37	355,200	91	9,990
91	416,575	11	3,642	36	35,906	18	56,829	26	320,199	335	782,174	141	30,426	93	98,833	54	160,982	47	491,933	35	2,927
8	10,183	2	533	3	3,650	3	6,000			185	73,627	151	34,947	32	26,680			2	12,000	7	180
14	20,025	6	2,400	6	4,958	1	4,667	1	8,000	102	56,609	83	14,659	11	9,950	8	32,000			11	1,228
8	9,875	1	225	6	5,650	1	4,000			94	50,560	68	18,001	19	16,989	7	15,600			1	50
94	445,490	9	2,285	38	42,267	17	55,941	30	344,997	87	123,096	49	10,062	21	17,434	10	32,600	7	63,000	10	1,120
14	125,733	3	168	2	2,150	3	9,090	6	114,825	17	3,738	17	3,738							5	1,125
61	147,067	11	2,370	29	36,119	10	29,546	11	79,682	42	32,234	27	4,630	12	12,604			3	15,000		16
136	893,757	20	4,876	39	36,300	29	82,708	48	769,873	411	700,323	231	41,823	76	78,040	38	121,760	66	458,700	50	3,693
58	289,135	3	700	29	38,742	11	44,593	15	206,100	11	1,215	11	1,215					8	118,000	13	1,715
164	931,299	12	3,885	55	59,940	45	146,496	52	720,978	129	166,249	81	11,353	40	36,866					64	14,436
83	424,005	9	2,893	29	30,772	13	39,639	32	350,711	32	13,416	24	3,616	8	9,800					73	7,069
67	179,363	14	5,360	35	36,553	4	14,400	14	123,050	89	27,563	85	22,713	4	4,850					37	2,818
105	834,413	13	3,133	32	30,577	18	52,071	42	748,632	83	19,785	81	18,285	2	1,500					86	3,302
50	328,304	2	666	22	22,232	8	27,848	18	278,058	274	187,719	189	22,794	110	78,125	23	72,400	2	14,400	43	1,677
53	166,349	7	3,365	32	41,150	2	6,667	12	115,167	198	136,608	144	16,448	37	52,340	16	58,320	1	9,500	64	8,209
31	74,095	6	815	15	14,166	7	23,114	3	36,000	80	99,845	41	8,210	35	36,135			4	55,500	91	4,514
30	40,691	6	1,275	13	17,119	4	11,297	2	11,000	86	165,133	67	9,083	2	1,700	2	4,400	15	150,000	99	2,839
34	145,798	2	900	17	18,607	6	19,000	8	107,291	12	18,665	7	665			5	18,000			134	5,166
5	5,775	2	575	1	750	2	4,450													132	2,789
5	8,250	1	800	1	1,070	3	6,680			11	6,970	4	820	7	6,150					133	7,023
23	57,697	8	1,226	7	6,461	3	8,000	5	42,000	53	10,299	49	5,689	4	4,600					151	6,378
35	110,014	7	1,835	16	17,789	4	10,710	8	79,680	33	17,966	29	6,816	2	1,550	2	9,600			116	11,781
1	850			1	850			3	57,000	5	625	5	625							1	22
8	70,362					5	13,362	3	57,000	17	2,255	17	2,255							12	930
6	95,000					6	95,000														
19	25,621	5	2,556	10	12,333	4	10,732	7	63,300	54	45,124	46	5,424	7	7,300	3	12,000	4	20,400	17	704
27	100,105	2	750	11	13,950	7	22,202	7	6,472	14	6,472	6	5,772	8	5,900					26	6,920
9	42,600	2	500	3	3,100	1	4,000	3	35,000	75	167,517	55	10,757	6	9,100	5	18,560	9	132,100	8	261
9	21,215	1	500	3	5,065	2	5,630	1	10,000	80	220,099	23	3,969	29	35,730	9	26,000	19	164,400	7	245
18	23,792	7	3,300	5	4,482	5	11,010	1	5,000	53	74,541	31	5,063	12	16,578	3	11,900	7	41,000	6	97
7	8,150	2	900	3	2,450	2	4,800			4	5,660	1	60	2	3,600	1	2,000			16	1,068
22	67,782	7	2,072	4	2,916	8	27,464	3	35,330	7	385	7	385							58	2,190
13	46,450	3	800	2	1,750	4	10,500	4	35,400	52	131,292	26	3,258	4	6,584	6	24,000	16	97,500	8	281
10	60,152			6	5,652	1	4,500	3	50,000	15	102,296	2	96	4	3,300	4	8,900	5	90,000	6	600
8	10,916	2	80	3	2,500	3	8,336													21	668
14	11,749	5	1,900	9	9,849					10	2,540	8	1,040	2	1,500					40	1,881
4	3,350	1	150	3	3,200					3	1,060	3	1,060							39	3,445
18	21,795	5	1,720	10	9,150	3	10,925			3	1,060	3	1,060							78	9,079
52	107,269	14	3,893	21	16,984	9	27,267	8	59,025	24	3,108	24	3,108							203	23,774
5	2,710	2	560	3	2,150					78	268,917	18	3,377	28	30,140	12	43,400	20	192,000	34	1,013
1	1,750			1	750					67	51,649	36	5,979	28	27,470			3	18,200	2	70
22	15,188	11	3,100	9	8,588	2	3,500			12	2,688	12	2,688							14	1,536
27	48,876	3	244	14	15,856	8	20,713	2	12,068	56	73,215	32	7,085	17	14,150	2	8,000	5	44,000	4	1,752
10	6,791	4	591	5	4,200	1	2,000			7	630									16	2,517
6	15,900	2	700	2	1,700	1	3,500	1	10,000	4	11,200									13	3,462
2	21,448							2	21,448	87	186,681	29	6,420	39	46,911	10	32,350	9	101,000		55
1	300	1	300							21	15,115	11	1,040	8	7,875	2	6,200			8	617
18	18,658	5	1,267	10	10,124	3	7,167			56	56,828	38	6,828	12	13,800	3	13,200	3	23,000	16	600
7	8,225	2	1,000	4	4,225	1	3,000			69	36,819	46	9,199	22	20,620			1	7,000	9	390
66	396,692	4	1,275	22	21,556	14	46,662	26	320,199	210	688,527	57	14,399	59	64,413	51	147,782	43	461,933	10	1,937

ELECTRICAL INDUSTRIES: 1917.

TABLE 109.—MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER.

DIVISION AND STATE.		Number of stations.	PRIMARY POWER.									
			Aggregate.		Total steam.		Steam engines.					
							Total.		500 horse-power or under.		Over 500 horsepower and under 2,000 horsepower.	
Number of units.	Horsepower.	Number of units.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.			
1	UNITED STATES.....	2,318	3,408	859,098	2,200	596,871	1,989	342,986	1,947	313,419	42	29,567
2	GEOGRAPHIC DIVISIONS:											
3	New England.....	72	113	56,030	68	44,265	42	11,211	38	8,445	4	2,766
4	Middle Atlantic.....	123	208	43,119	144	34,378	126	23,465	123	21,749	3	1,716
5	East North Central.....	567	873	270,413	641	203,512	564	104,997	547	92,322	17	12,675
6	West North Central.....	760	1,081	154,821	545	123,471	511	84,920	501	78,145	10	6,775
7	South Atlantic.....	330	416	88,793	332	79,516	310	50,763	307	48,728	3	2,035
8	East South Central.....	154	244	44,972	212	43,161	200	30,831	198	29,531	2	1,300
9	West South Central.....	191	311	43,677	202	34,406	189	27,099	187	25,799	2	1,300
10	Mountain.....	73	94	16,173	32	5,587	29	5,075	29	5,075		
	Pacific.....	48	68	141,100	24	28,575	18	4,625	17	3,625	1	1,000
11	NEW ENGLAND:											
12	Maine.....	6	9	2,438	2	475	2	475	2	475		
13	New Hampshire.....	4	7	1,593	4	893	4	893	4	893		
14	Vermont.....	16	19	7,585	4	1,750	2	350	2	350		
15	Massachusetts.....	39	57	37,754	44	35,497	25	8,038	21	5,272	4	2,766
16	Rhode Island.....	1										
	Connecticut.....	6	21	6,660	14	5,660	9	1,455	9	1,455		
17	MIDDLE ATLANTIC:											
18	New York.....	55	94	18,324	64	14,444	56	9,353	55	8,753	1	600
19	New Jersey.....	16	28	5,836	14	3,894	12	2,739	11	2,223	1	516
	Pennsylvania.....	52	86	18,959	66	16,040	58	11,373	57	10,773	1	600
20	EAST NORTH CENTRAL:											
21	Ohio.....	149	209	64,678	162	59,539	145	28,678	139	24,878	6	4,300
22	Indiana.....	90	124	47,059	114	46,509	94	21,905	88	17,830	6	4,075
23	Illinois.....	121	180	73,012	140	32,453	130	22,888	127	20,188	3	2,700
24	Michigan.....	109	202	62,537	128	50,644	104	18,309	102	16,709	2	1,600
	Wisconsin.....	98	158	23,127	97	14,367	91	13,217	91	13,217		
25	WEST NORTH CENTRAL:											
26	Minnesota.....	133	191	31,657	124	26,776	115	18,191	114	17,591	1	600
27	Iowa.....	143	161	21,271	96	17,114	92	14,740	92	14,740		
28	Missouri.....	87	152	23,528	112	21,399	111	20,949	107	17,949	4	3,000
29	North Dakota.....	26	41	2,786	16	2,175	16	2,175	16	2,175		
30	South Dakota.....	36	63	5,378	18	2,396	16	1,945	16	1,945		
31	Nebraska.....	149	209	22,357	75	16,040	67	9,680	66	8,930	1	750
	Kansas.....	186	264	47,844	104	37,572	94	17,240	90	14,815	4	2,425
32	SOUTH ATLANTIC:											
33	Delaware.....	5	12	1,620	12	1,620	12	1,620	12	1,620		
34	Maryland.....	11	17	4,575	10	4,140	8	1,390	8	1,390		
35	District of Columbia.....											
36	Virginia.....	24	38	10,810	17	5,943	12	1,610	12	1,610		
37	West Virginia.....	9	13	2,062	8	1,655	8	1,655	8	1,655		
38	North Carolina.....	80	78	15,625	59	14,235	51	10,565	48	8,530	8	2,035
39	South Carolina.....	41	45	6,373	39	6,136	39	6,136	39	6,136		
40	Georgia.....	128	151	21,064	134	20,083	134	20,083	134	20,083		
	Florida.....	32	62	26,664	53	25,704	46	7,704	46	7,704		
41	EAST SOUTH CENTRAL:											
42	Kentucky.....	22	41	11,441	36	11,330	30	5,085	29	4,335	1	750
43	Tennessee.....	36	65	12,948	51	12,288	47	7,838	47	7,838		
44	Alabama.....	45	58	8,155	53	7,490	53	7,490	52	6,940	1	550
	Mississippi.....	51	80	12,428	72	12,063	70	10,418	70	10,418		
45	WEST SOUTH CENTRAL:											
46	Arkansas.....	25	39	7,030	35	6,350	33	5,450	32	4,800	1	650
47	Louisiana.....	36	65	10,738	32	7,426	29	4,934	28	4,284	1	650
48	Oklahoma.....	106	167	18,214	108	14,125	103	12,760	103	12,760		
	Texas.....	24	40	7,695	27	6,505	24	3,955	24	3,955		
49	MOUNTAIN:											
50	Montana.....	6	12	1,895	7	1,505	7	1,505	7	1,505		
51	Idaho.....	8	6	2,053								
52	Wyoming.....	12	12	721	3	320	3	320	3	320		
53	Colorado.....	16	22	3,052	13	1,900	12	1,760	12	1,760		
54	New Mexico.....	4	10	1,550	4	815	4	815	4	815		
55	Arizona.....	4	3	530	1	400	1	400	1	400		
56	Utah.....	22	29	6,372	4	647	2	275	2	275		
	Nevada.....	1										
57	PACIFIC:											
58	Washington.....	14	16	71,840	2	14,500						
59	Oregon.....	15	21	4,965	4	530	4	530	4	530		
	California.....	19	31	64,295	18	13,545	14	4,085	13	3,085	1	1,000

GENERAL TABLES.

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BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

PRIMARY POWER—continued.																					
Steam turbines.										Water wheels and turbines.										Internal-combustion engines.	
Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horsepower.		2,000 horse-power and under 5,000 horsepower.		5,000 horse-power and over.		Total.		500 horse-power or under.		Over 500 horse-power and under 2,000 horsepower.		2,000 horse-power and under 5,000 horsepower.		5,000 horse-power and over.			
Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.		
211	253,885	74	21,792	106	103,858	23	71,251	8	56,984	265	200,395	221	37,107	22	18,288	6	15,500	16	129,500	943	61,832
26	33,054	4	1,033	16	12,421	6	18,600			33	9,963	30	7,738	3	2,225					12	1,802
18	10,913	7	1,890	11	9,023					15	2,096	15	2,096							49	6,645
77	98,515	34	10,965	30	30,795	7	19,473	6	37,282	82	57,343	69	9,655	4	4,288	2	4,200	7	39,200	150	9,558
34	38,551	13	4,510	17	16,961	3	10,378	1	6,702	21	2,301	21	2,301							515	29,049
22	28,753	4	670	15	16,083	3	12,000			35	6,677	31	4,277	4	2,400					49	2,000
12	12,330	2	950	9	9,380	1	2,000			7	920	7	920							25	891
13	7,307	7	1,262	6	6,045					4	558	4	558							105	8,713
3	512	3	512							31	8,500	28	6,775	3	1,725					31	2,086
6	23,960			2	2,150	3	8,800	1	13,000	37	112,037	16	2,787	8	7,650	4	11,300	9	90,300	7	488
										7	1,963	7	1,963								
										3	700	3	700								
2	1,400	1	400	1	1,000					15	5,835	12	3,610	3	2,225						
19	27,459	3	633	10	8,226	6	18,600			6	1,280	6	1,280							7	967
5	4,195			5	4,195					2	175	2	175							5	835
8	5,091	2	335	6	4,756					10	1,625	10	1,625							20	2,255
2	1,155	1	155	1	1,000					1	112	1	112							13	1,830
8	4,667	4	1,400	4	3,267					4	359	4	359							16	2,560
17	30,861	7	2,850	6	5,330	1	2,681	3	20,000	1	200	1	200							46	4,939
20	24,604	7	2,690	10	9,850	2	6,032	1	6,032	1	100	1	100							9	450
10	9,565	6	1,265	3	3,300			1	5,000	7	39,200									33	1,359
24	32,335	8	3,010	11	12,315	4	10,760	1	6,250	40	10,496	36	6,208	4	4,288			7	39,200	34	1,897
6	1,150	6	1,150							33	7,347	31	3,147			2	4,200			28	1,413
9	8,585	3	910	5	5,675	1	2,000			10	1,303	10	1,303							57	3,578
4	2,374	2	900	2	1,474					6	745	6	745							59	3,412
1	450	1	450																	40	2,129
2	450	2	450																	25	611
8	6,360	2	350	6	6,010					4	215	4	215							45	2,983
10	20,332	3	1,450	4	3,802	2	8,378	1	6,702	1	38	1	38							130	6,102
																				159	10,234
2	2,750			2	2,750					2	150	2	150							5	285
5	4,833			5	4,833					16	4,750	12	2,350	4	2,400					5	117
8	3,670	4	670	4	3,000					1	27	1	27							4	380
										10	1,140	10	1,140							9	250
7	18,000			4	6,000	3	12,000			5	560	5	560							6	237
										1	60	1	60							12	421
6	6,245			6	6,245															8	910
4	4,450	2	950	1	1,500	1	2,000			4	360	4	360							5	111
2	1,635			2	1,635					3	560	3	560							10	300
																				2	105
																				8	375
3	900	1	100	1	800															4	680
2	2,492	1	147	2	2,345															33	3,312
5	1,365	4	715	1	650					2	308	2	308							57	3,781
3	2,550	1	300	2	2,250					2	250	2	250							11	940
										4	1,975	1	250	3	1,725					5	390
1	140	1	140							2	800	2	800							2	78
																				9	401
2	372	2	372							25	5,725	25	5,725							7	352
																				6	735
																				2	130
2	14,500			1	1,500			1	13,000	14	57,340	4	740	1	1,000	3	7,300	6	48,300		
4	9,450			1	650	3	8,800			11	4,247	7	617	4	3,600					6	188
										12	50,450	5	1,400	3	3,050	1	4,000	3	42,000	1	300

TABLE 110.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GENERATING AND SUBSTATION

GENERATING EQUIPMENT—NUMBER AND KILOWATT CAPACITY OF DYNAMOS.																				
DIVISION AND STATE.		Number of stations.	Direct current.														Alternating and polyphase current.			
			Total.		Constant voltage.				Constant amperage.				Alternating and polyphase current.							
					Operated by water power.		Operated by other power.		Operated by water power.		Operated by other power.									
Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.					
1	UNITED STATES.....	6,542	13,428	8,994,407	331	81,337	2,864	337,234	25	1,775	283	16,841	2,521	2,702,785	7,404	5,854,935				
2	GEOGRAPHIC DIVISIONS:																			
3	New England.....	383	990	918,152	38	4,497	91	23,432	11	757	19	825	409	233,775	423	654,866				
4	Middle Atlantic.....	679	2,016	2,362,759	102	59,935	360	99,784	10	690	119	6,383	384	474,922	1,041	1,721,045				
5	East North Central.....	1,385	2,931	2,089,949	106	8,717	664	108,470	4	328	57	3,109	475	298,442	1,635	1,670,783				
6	West North Central.....	1,730	2,962	780,138	28	2,331	1,100	48,185			36	1,168	210	214,563	1,588	515,991				
7	South Atlantic.....	1,728	1,225	785,619	11	1,497	139	12,249			36	4,116	283	342,026	756	375,731				
8	East South Central.....	410	736	366,532	3	21	198	14,383			8	365	73	138,027	459	213,736				
9	West South Central.....	636	1,228	242,375	4	79	204	19,315			4	215	27	4,650	989	218,116				
10	Mountain.....	337	750	533,997	28	2,316	75	5,408			2	135	322	399,328	323	126,810				
	Pacific.....	254	590	964,986	11	1,944	38	6,008			2	25	338	597,052	201	359,957				
11	NEW ENGLAND:																			
12	Maine.....	93	178	63,242	17	1,670	9	369	3	124	1	25	116	49,729	32	11,325				
13	New Hampshire.....	59	140	65,580	5	1,053	9	1,433					90	39,858	36	23,216				
14	Vermont.....	59	127	51,751	5	585	2	95					97	40,890	23	10,171				
15	Massachusetts.....	129	352	478,933	5	239	31	12,625	8	633	18	800	60	78,718	230	385,918				
16	Rhode Island.....	9	36	106,017			3	1,500					14	2,795	19	101,722				
	Connecticut.....	43	157	152,649	6	940	37	7,410					32	21,785	82	122,514				
17	MIDDLE ATLANTIC:																			
18	New York.....	332	920	1,302,304	89	57,967	111	17,070	5	470	13	643	275	361,194	427	765,480				
19	New Jersey.....	63	234	249,521	1	30	71	33,860			6	329	7	922	149	214,380				
	Pennsylvania.....	284	862	910,434	12	1,938	178	48,854	5	220	100	5,411	102	112,806	465	741,205				
20	EAST NORTH CENTRAL:																			
21	Ohio.....	335	594	420,481	5	133	170	37,199	2	28	18	853	17	8,650	382	373,618				
22	Indiana.....	237	445	227,826			98	9,711			10	633	30	18,671	307	196,810				
23	Illinois.....	303	696	737,621	12	2,555	185	41,454			16	763	30	37,953	453	654,896				
24	Michigan.....	241	648	451,276	31	2,210	91	8,338			10	700	269	144,192	247	295,838				
	Wisconsin.....	269	548	262,646	58	3,819	120	11,768	2	300	3	160	129	88,976	236	147,623				
25	WEST NORTH CENTRAL:																			
26	Minnesota.....	255	470	162,854	17	1,775	168	7,303			6	121	68	69,704	211	83,951				
27	Iowa.....	325	488	184,506	2	450	174	10,239					60	115,078	252	58,739				
28	Missouri.....	298	494	166,813	1	8	155	8,544			11	336	9	11,573	318	146,052				
29	North Dakota.....	127	269	20,041			176	6,688			10	561			83	12,792				
30	South Dakota.....	131	244	24,328	1	30	111	2,760			7	123	11	4,080	114	17,360				
31	Nebraska.....	297	492	78,227	7	68	210	5,800					42	6,863	233	65,506				
	Kansas.....	302	506	143,374			106	6,551			2	27	20	7,305	377	129,491				
32	SOUTH ATLANTIC:																			
33	Delaware.....	12	25	2,697			8	348			2	50	4	425	11	1,874				
34	Maryland.....	50	90	73,591			14	523			15	837	14	1,556	47	70,675				
35	District of Columbia.....	1	15	55,000			9	3,000							6	52,000				
36	Virginia.....	94	165	65,913			29	1,819			1	125	55	37,137	80	26,832				
37	West Virginia.....	72	148	108,611			27	3,956			16	3,019	13	5,284	92	91,352				
38	North Carolina.....	159	198	153,410	1	37	15	744			2	85	71	110,297	109	42,247				
39	South Carolina.....	82	167	159,255	6	970	5	172					72	137,130	84	20,983				
40	Georgia.....	176	251	84,330	4	490	22	1,324					51	47,317	174	35,199				
	Florida.....	82	166	37,812			10	363					3	2,880	153	34,599				
41	EAST SOUTH CENTRAL:																			
42	Kentucky.....	125	233	69,442	2	16	100	6,410			5	220	3	170	128	62,636				
43	Tennessee.....	106	190	145,335	1	5	31	1,941			2	120	46	96,496	110	46,783				
44	Alabama.....	82	149	128,809			25	3,656			1	25	24	41,371	99	83,457				
	Mississippi.....	97	164	23,246			37	2,376							127	20,870				
45	WEST SOUTH CENTRAL:																			
46	Arkansas.....	96	180	24,913			44	2,372			1	75	6	1,100	129	21,366				
47	Louisiana.....	85	156	25,762			45	5,628							111	20,139				
48	Oklahoma.....	201	349	57,783			81	3,610					5	935	313	53,238				
	Texas.....	254	543	133,917	4	79	84	7,710			3	140	16	2,615	436	122,373				
49	MOUNTAIN:																			
50	Montana.....	60	159	182,079	5	181	37	1,621			1	50	80	175,669	36	4,559				
51	Idaho.....	46	73	37,103	3	44	3	55					56	35,346	11	1,658				
52	Wyoming.....	43	92	20,627	2	70	6	592					12	2,454	72	17,511				
53	Colorado.....	69	159	94,791	15	1,957	16	1,989					42	45,410	86	45,435				
54	New Mexico.....	29	66	12,713			11	851			1	85	5	513	49	11,264				
55	Arizona.....	29	49	26,972			2	300					4	7,000	43	19,672				
56	Utah.....	47	124	147,359	3	64							108	121,964	13	25,331				
	Nevada.....	14	28	12,353									15	10,973	13	1,380				
57	PACIFIC:																			
58	Washington.....	88	126	99,875	2	27	18	3,403			2	25	62	73,205	42	23,215				
59	Oregon.....	68	120	47,917	3	112	12	758					68	30,727	37	16,320				
60	California.....	98	344	817,194	6	1,805	8	1,847					208	493,120	122	320,422				

GENERAL TABLES.

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AND MAIN STATION EQUIPMENT AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

SUBSTATION AND MAIN STATION EQUIPMENT—NUMBER AND KILOWATT CAPACITY.																OUTPUT OF STATIONS (KILOWATT HOURS).	
Rotary converters and motor generator sets.				Boosters.				Transformers.				Auxiliary generators.				Generated during the year.	Purchased during the year.
Substation.		Main station.		Substation.		Main station.		Substation.		Main station.		Substation.		Main station.			
Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.		
1,966	1,386,406	693	512,197	231	28,795	143	21,413	16,198	5,651,360	5,848	3,847,646	77	10,167	261	24,456	25,438,303,272	5,605,745,962
168	90,215	85	34,123	45	5,125	39	1,675	1,438	448,080	647	365,607	14	2,237	51	2,655	1,835,584,072	578,110,859
800	614,306	173	106,010	86	10,356	38	8,589	3,670	1,563,041	943	698,386	13	1,560	43	4,893	7,659,317,763	1,917,380,779
454	381,021	186	74,061	34	6,394	25	8,787	3,338	1,117,538	1,476	742,719	13	1,667	56	4,734	5,757,150,135	615,606,822
138	95,500	95	23,499	26	2,318	28	1,288	2,231	492,054	885	341,635	22	2,095	43	6,528	1,776,478,523	790,506,038
152	85,713	19	231,910	14	899	3	40	1,358	531,349	400	455,554	8	1,285	15	1,262	1,745,296,143	416,165,234
19	4,720	25	8,280					317	91,479	184	407,176	1	38	6	885	1,048,514,771	355,590,851
25	14,040	59	15,885					245	40,537	198	40,679			6	202	432,645,362	157,603,725
86	29,950	27	6,014	4	83	6	366	1,293	392,208	532	280,932	4	1,200	28	2,319	2,086,194,737	338,811,725
124	73,940	24	12,395	22	3,620	4	70	2,308	945,074	533	514,958	2	85	13	978	3,096,825,266	435,968,929
12	5,775	12	3,213	2	70	3	27	238	48,799	102	36,915	5	875			165,504,379	39,824,680
8	2,260			1	125			129	23,762	80	27,430					180,456,223	19,194,805
103	56,730	54	21,830	41	4,830	34	1,438	151	24,896	70	15,325					66,079,504	34,107,260
8	10,000	4	655	1	100	1	90	574	198,932	242	162,938	5	327	26	1,382	937,124,653	287,081,988
37	15,450	13	7,025			1	120	134	67,902	48	61,536	1	400	17	825	161,556,170	83,091,898
								212	83,787	106	61,463	3	635	8	448	345,563,143	114,860,228
425	426,501	52	39,605	60	7,597	20	7,231	1,616	758,605	460	364,357			6	300	3,828,592,181	1,528,331,264
93	66,050	32	21,285	2	270	4	420	249	182,859	75	60,935			12	600	781,230,790	39,319,823
282	121,755	89	45,120	24	2,489	14	938	1,805	651,577	408	273,064	13	1,560	25	3,983	3,049,494,792	349,729,692
72	29,947	42	22,085	8	814	2	119	605	247,702	378	112,233	9	417	22	2,477	1,083,514,202	124,012,007
33	14,055	20	4,076	3	530			370	47,007	196	66,899			13	525	441,423,385	71,605,036
198	242,074	56	21,534	28	5,050	16	7,788	1,178	329,198	497	219,017			7	548	2,210,372,750	245,263,854
138	89,125	43	14,057			3	430	777	415,864	259	308,450	1	150	8	627	1,504,239,843	42,706,367
13	5,820	25	12,389			4	450	410	77,777	156	41,120	3	1,100	6	557	517,599,955	132,018,558
31	22,285	18	2,025	4	850	5	514	709	157,750	178	117,050	2	950	11	1,860	440,932,508	313,050,016
10	3,964	24	8,682	10	560	4	631	537	96,481	202	108,112	8	603	8	3,331	614,808,584	49,226,325
79	64,180	23	4,700	11	893	2	53	293	213,728	121	20,411	12	542	7	907	266,431,159	385,848,906
1	3	8	1,725			5	22	21	1,517	14	1,835			1	26	22,978,006	2,369,714
2	150	4	690			6	95	140	8,266	78	7,177			6	160	31,810,487	2,245,415
1	25	5	2,055			4	31	198	13,439	142	28,910			4	110	129,531,131	6,268,247
14	4,893	13	3,612	1	15	2	540	333	30,873	150	58,140			6	84	269,983,648	31,567,415
31	36,740			6	314	1	22	11	415	11	1,095					3,359,280	561,700
43	25,100			6	550			35	5,556	7	4,505	2	400			182,407,826	185,827,516
13	6,110	2	2,000					51	41,720							140,672,647	5,910
56	9,338	7	228,950					112	37,196	40	39,950	1	100			107,580,758	24,628,820
1	6,000							173	37,990	41	38,093	3	700			204,107,945	30,199,566
5	1,900	3	1,300	1	10			540	222,576	99	166,068					371,711,733	57,670,402
3	825	5	1,660	1	25	2	18	255	121,490	109	166,645	2	85	4	500	500,430,903	96,081,004
		2	1,000					116	44,800	74	36,575			11	762	184,138,059	19,458,915
								65	19,616	19	4,623					50,887,992	1,731,401
9	2,400	9	3,855					168	24,425	36	26,550			2	150	122,630,433	20,352,998
2	250	5	1,150					111	43,988	67	152,972	1	38	3	485	564,914,272	323,253,612
8	2,070	6	1,675					33	22,981	71	227,124					330,771,965	11,900,279
		5	1,600					5	85	10	530			1	250	30,498,101	83,962
11	7,500	12	3,010					47	4,397	39	3,383					38,644,801	3,359,482
3	700	7	1,150					11	4,022	5	1,360					26,008,144	83,688,132
11	5,840	28	8,530					67	9,265	57	9,591					100,737,632	22,339,501
								120	22,853	97	27,545			6	202	317,254,285	48,216,610
16	2,740	6	436			2	36	285	153,197	19	5,565	3	900	1	50	965,453,777	231,458,307
2	450							234	38,583	107	44,510					145,307,596	21,914,266
14	2,075	7	1,060					40	3,598	27	5,100			10	1,765	27,391,551	260,535
38	9,075	6	2,216	4	83	1	100	392	71,063	161	67,207	1	300	6	240	274,223,978	59,596,808
3	1,200	3	612			1	80	23	1,790	16	2,710			1	14	17,244,768	722,688
12	10,910	5	1,700					18	1,215	25	4,260					65,731,753	14,516,807
1	500					2	200	196	104,736	178	139,822					496,995,136	5,035,888
								105	18,026	49	11,758			10	250	53,846,178	5,316,397
10	3,235	5	3,860	2	510	4	70	246	69,272	99	87,438	2	85	10	505	242,370,956	13,262,882
2	470	4	4,510					206	32,096	89	29,082			2	350	107,886,973	13,294,216
112	70,235	15	4,025	20	3,110			1,856	843,706	346	398,438			1	123	2,746,567,337	409,411,831

TABLE 111.—COMMERCIAL CENTRAL ELECTRIC STATIONS—GENERATING AND SUBSTATION AND MAIN

GENERATING EQUIPMENT—NUMBER AND KILOWATT CAPACITY OF DYNAMOS.																
DIVISION AND STATE.		Number of stations.														
			Total.		Direct current.								Alternating and polyphase current.			
					Constant voltage.				Constant amperage.							
					Operated by water power.		Operated by other power.		Operated by water power.		Operated by other power.					
					Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.
1	UNITED STATES.....	4,224	9,991	8,411,944	308	79,998	2,105	299,089	19	1,255	205	12,481	2,319	2,580,567	5,035	5,438,554
2	GEOGRAPHIC DIVISIONS:															
3	New England.....	311	885	879,368	38	4,497	90	22,167	9	637	19	825	383	227,595	356	623,647
4	Middle Atlantic.....	556	1,794	2,334,640	102	59,935	331	97,087	8	590	106	5,971	372	473,497	873	1,097,560
5	East North Central.....	818	2,026	1,898,549	93	8,142	451	98,063	2	28	33	1,552	420	259,734	1,027	1,531,030
6	West North Central.....	970	1,885	674,697	23	1,891	723	33,269			15	231	198	213,096	926	426,210
7	South Atlantic.....	398	802	673,221	10	1,460	103	11,031			21	3,507	255	336,957	413	320,266
8	East South Central.....	256	492	336,226	3	21	144	11,762			3	110	68	137,322	274	187,011
9	West South Central.....	445	924	212,349	4	79	173	17,449			3	175	23	4,200	721	190,446
10	Mountain.....	264	664	523,830	28	2,316	73	5,366			1	85	294	394,046	268	122,017
	Pacific.....	206	519	879,064	7	1,657	27	2,895			2	25	306	534,120	177	340,367
11	NEW ENGLAND:															
12	Maine.....	87	168	61,767	17	1,670	9	369	1	4	1	25	110	48,499	30	11,200
13	New Hampshire.....	55	135	64,710	5	1,053	9	1,433					87	39,383	34	22,841
14	Vermont.....	43	110	46,971	5	595	2	95					84	37,410	19	8,871
15	Massachusetts.....	81	299	451,870	5	239	28	12,245	8	633	18	800	57	77,843	183	360,110
16	Rhode Island.....	8	36	106,017			3	1,500					14	2,795	19	101,722
	Connecticut.....	37	137	148,033	6	940	29	6,525					31	21,665	71	118,903
17	MIDDLE ATLANTIC:															
18	New York.....	277	827	1,189,934	89	57,967	98	16,348	5	470	13	643	267	360,079	355	754,427
19	New Jersey.....	47	207	245,561	1	30	69	32,835			6	329	6	862	125	211,505
	Pennsylvania.....	232	760	899,145	12	1,938	164	47,904	3	120	89	4,999	99	112,556	393	731,628
20	EAST NORTH CENTRAL:															
21	Ohio.....	186	383	374,658	5	133	124	34,453	2	28	14	617	16	8,530	222	330,897
22	Indiana.....	147	308	194,041			65	7,561			6	313	29	18,471	208	167,696
23	Illinois.....	182	508	685,067	12	2,555	139	39,680			11	552	23	9,953	323	632,327
24	Michigan.....	132	441	407,879	27	2,035	44	7,056					241	137,530	129	261,258
	Wisconsin.....	171	386	236,904	49	3,419	79	9,313			2	70	111	85,250	145	138,852
25	WEST NORTH CENTRAL:															
26	Minnesota.....	122	261	141,720	12	1,335	94	4,020			1	8	64	69,079	110	67,278
27	Iowa.....	182	323	169,827	2	450	94	6,103					56	114,416	171	48,558
28	Missouri.....	206	340	150,109	1	8	122	6,799			3	42	9	11,573	205	131,687
29	North Dakota.....	101	226	17,757			148	5,772			5	87			73	11,898
30	South Dakota.....	95	182	20,744	1	30	84	2,084			5	91	11	4,050	81	14,489
31	Nebraska.....	148	295	63,375	7	68	121	3,013					39	6,723	128	53,571
	Kansas.....	116	238	111,165			60	5,478			1	3	19	7,255	158	98,429
32	SOUTH ATLANTIC:															
33	Delaware.....	7	10	1,617			2	118					4	425	4	1,074
34	Maryland.....	39	70	70,364			11	450			13	757	12	1,476	34	67,681
35	District of Columbia.....	1	15	55,000			9	2,000							6	52,000
36	Virginia.....	70	132	57,912			25	1,668			1	125	42	33,437	64	22,682
37	West Virginia.....	63	128	102,603			24	3,815			6	2,600	12	5,260	86	90,928
38	North Carolina.....	79	119	141,755			8	550			1	25	63	109,502	47	81,678
39	South Carolina.....	41	123	155,102	6	970	4	157					72	137,130	41	16,845
40	Georgia.....	48	101	70,156	4	490	15	1,235					47	46,847	35	21,584
	Florida.....	50	104	18,712			5	38					3	2,890	56	15,794
41	EAST SOUTH CENTRAL:															
42	Kentucky.....	103	188	62,150	2	16	83	5,626			2	85	3	170	98	56,253
43	Tennessee.....	70	129	135,578	1	5	19	876					45	96,136	64	88,561
44	Alabama.....	37	92	123,006			22	3,563			1	25	20	41,016	49	78,402
	Mississippi.....	46	83	15,492			20	1,697							63	13,795
45	WEST SOUTH CENTRAL:															
46	Arkansas.....	71	138	20,270			37	2,082			1	75	6	1,100	94	17,013
47	Louisiana.....	49	91	18,286			33	4,896					3		58	18,390
48	Oklahoma.....	95	190	45,372			26	3,504						735	161	41,133
	Texas.....	230	505	128,421	4	79	77	6,967			2	100	14	2,365	408	118,910
49	MOUNTAIN:															
50	Montana.....	54	147	180,767	5	181	37	1,621					80	175,668	25	3,297
51	Idaho.....	38	67	35,903	3	44	2	30					52	34,196	10	1,633
52	Wyoming.....	31	81	20,225	2	70	5	575					12	2,454	62	17,126
53	Colorado.....	53	138	92,826	15	1,957	16	1,989					40	44,910	67	43,970
54	New Mexico.....	25	57	11,783			11	851			1	85	5	513	40	10,334
55	Arizona.....	25	47	26,682			2	300					4	7,000	41	19,362
56	Utah.....	25	99	143,311	3	64							86	118,332	10	24,915
	Nevada.....	13	28	12,353									15	10,973	13	1,380
57	PACIFIC:															
58	Washington.....	74	103	55,288	1	15	11	403			2	25	49	40,330	40	14,515
59	Oregon.....	53	103	45,292	2	87	8	645					59	28,595	34	15,965
	California.....	79	313	778,484	4	1,555	8	1,847					198	465,195	103	309,887

GENERAL TABLES.

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STATION EQUIPMENT AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

SUBSTATION AND MAIN STATION EQUIPMENT—NUMBER AND KILOWATT CAPACITY.																OUTPUT OF STATIONS (KILOWATT HOURS).		
Rotary converters and motor generator sets.				Boosters.				Transformers.				Auxiliary generators.				Generated during the year.	Purchased during the year.	
Substation.		Main station.		Substation.		Main station.		Substation.		Main station.		Substation.		Main station.				
Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.	Num- ber.	Kilo- watts.			
1,987	1,381,141	648	503,360	222	28,632	131	20,832	15,206	5,469,360	4,968	3,686,438	68	9,520	236	22,754	24,398,983,183	5,413,207,563	1
165	89,980	83	33,748	43	5,067	36	1,225	1,374	441,469	580	358,582	12	2,075	49	2,595	1,776,289,676	557,426,136	2
300	614,308	170	105,875	84	10,326	38	8,599	3,616	1,560,936	910	697,478	13	1,560	43	4,893	7,618,232,163	1,906,230,341	3
441	379,427	168	67,340	34	6,394	24	8,751	2,971	1,064,105	1,031	681,863	12	1,517	49	4,170	5,348,721,569	540,242,830	4
135	95,360	81	23,194	23	2,288	23	1,842	2,046	486,396	712	325,443	20	1,995	38	6,428	1,623,567,900	770,080,790	5
152	85,713	19	231,910	12	864	2	25	1,261	510,459	341	452,043	6	1,135	12	812	1,669,198,197	381,714,855	6
19	4,720	25	8,280	.....	.....	.....	.....	308	91,254	178	407,087	1	38	6	885	1,012,378,561	353,496,787	7
25	14,040	53	14,660	.....	.....	.....	.....	225	40,167	180	40,156	.....	.....	6	202	441,694,042	153,718,811	8
86	26,950	25	5,958	4	83	4	330	1,254	387,317	503	279,703	4	1,200	28	2,319	2,017,305,528	334,888,923	9
114	70,645	24	12,395	22	3,620	4	70	2,151	867,257	473	444,083	.....	.....	5	450	2,891,595,547	415,418,080	10
.....	.....	2	1,400	.....	.....	3	27	227	48,059	102	36,915	5	875	.....	.....	162,930,638	39,523,860	11
12	5,775	12	3,213	1	20	.....	.....	129	23,762	78	27,410	.....	.....	.....	.....	159,967,555	19,171,775	12
8	2,260	.....	.....	1	125	.....	.....	135	23,556	58	14,465	.....	.....	.....	.....	58,472,054	33,213,651	13
100	56,465	53	21,755	40	4,812	31	988	539	194,653	197	157,169	3	165	24	1,322	863,857,242	271,777,540	14
8	10,000	4	655	1	100	1	90	134	67,902	48	61,536	1	400	17	825	161,856,170	82,991,758	15
37	15,450	12	6,725	.....	.....	1	120	210	83,537	97	61,067	3	635	8	448	339,206,017	110,747,552	16
425	426,501	52	39,605	58	7,567	20	7,231	1,596	757,400	446	363,898	.....	.....	6	300	3,809,608,046	1,523,442,757	17
98	66,060	29	21,150	2	270	4	420	249	182,859	71	60,650	.....	.....	12	600	776,096,559	39,068,433	18
282	121,755	89	45,120	24	2,489	14	938	1,771	660,677	393	272,930	13	1,560	25	3,993	3,032,537,558	343,899,151	19
72	29,947	39	19,985	8	814	2	119	547	229,358	230	106,461	9	417	18	1,952	977,013,080	117,739,459	20
83	14,055	16	3,846	3	530	.....	.....	334	45,523	180	65,480	.....	.....	13	525	331,527,002	68,056,350	21
185	240,480	49	17,350	23	5,050	15	7,752	992	293,893	308	178,819	.....	.....	7	548	2,057,451,869	189,070,888	22
188	89,125	39	13,770	.....	.....	3	430	736	410,345	204	291,855	.....	.....	5	588	1,432,636,234	38,735,644	23
18	5,520	25	12,339	.....	.....	4	450	362	74,986	129	39,248	3	1,100	6	557	500,063,384	126,640,489	24
29	22,245	12	1,950	4	850	5	514	697	157,260	170	116,755	2	950	11	1,860	414,943,236	304,677,002	25
10	3,964	23	8,632	10	560	2	608	478	64,811	176	107,522	8	603	8	3,381	593,887,643	45,663,674	26
78	64,080	20	4,637	9	878	1	50	268	212,967	75	19,591	10	442	7	907	241,267,502	384,155,409	27
1	8	6	1,650	.....	.....	5	22	21	1,517	12	1,825	.....	.....	.....	.....	21,081,058	1,517,279	28
2	150	4	690	.....	.....	6	95	138	8,258	59	7,100	.....	.....	4	110	27,832,178	1,899,445	29
1	25	4	2,060	.....	.....	2	18	176	13,055	112	28,479	.....	.....	4	110	108,214,800	3,249,329	30
14	4,898	12	3,585	.....	.....	2	540	268	28,528	108	44,171	.....	.....	4	60	216,341,346	28,918,652	31
31	36,740	.....	.....	6	314	1	22	11	415	11	1,095	.....	.....	.....	.....	2,475,900	561,700	32
48	25,100	.....	.....	6	560	.....	.....	32	5,500	7	4,505	2	400	.....	.....	176,422,138	185,658,043	33
18	6,110	2	2,000	.....	.....	.....	.....	51	41,720	.....	.....	.....	.....	.....	.....	140,672,647	5,910	34
56	9,338	7	225,950	.....	.....	.....	.....	91	35,848	34	38,950	.....	.....	.....	.....	95,651,186	23,830,438	35
1	6,000	.....	.....	.....	.....	.....	.....	173	37,990	41	38,093	3	700	.....	.....	202,260,794	30,197,910	36
5	1,900	3	1,300	.....	.....	.....	.....	523	220,447	88	164,400	.....	.....	.....	.....	358,027,715	42,605,411	37
3	525	5	1,660	.....	.....	1	8	241	120,473	103	165,120	1	35	3	250	495,531,481	91,918,948	38
.....	.....	2	1,000	.....	.....	.....	.....	89	40,550	40	35,305	.....	.....	9	562	170,388,011	5,594,395	39
.....	.....	.....	.....	.....	.....	.....	.....	50	7,516	17	4,575	.....	.....	.....	.....	27,768,325	1,342,100	40
9	2,400	9	3,855	.....	.....	.....	.....	168	24,425	36	26,550	.....	.....	2	150	112,274,252	20,329,348	41
2	250	5	1,150	.....	.....	.....	.....	102	43,763	64	152,907	1	38	3	485	552,841,201	322,977,450	42
8	2,070	6	1,675	.....	.....	.....	.....	33	22,981	68	227,100	.....	.....	.....	.....	326,525,108	10,179,989	43
.....	.....	5	1,600	.....	.....	.....	.....	5	85	10	530	.....	.....	1	250	20,738,000	.....	44
11	7,500	9	2,385	.....	.....	.....	.....	46	4,375	25	2,997	.....	.....	.....	.....	32,784,841	2,884,732	45
8	700	12	3,195	.....	.....	.....	.....	11	4,022	3	60	.....	.....	.....	.....	15,313,868	83,608,532	46
11	5,840	28	8,530	.....	.....	.....	.....	66	9,215	56	9,558	.....	.....	.....	.....	86,984,421	22,118,000	47
.....	.....	.....	.....	.....	.....	.....	.....	102	22,555	96	27,541	.....	.....	6	202	306,610,912	45,107,538	48
16	2,740	4	380	.....	.....	.....	.....	284	153,122	19	5,565	3	900	1	50	962,621,539	231,458,307	49
2	450	.....	.....	.....	.....	.....	.....	228	36,333	107	44,510	.....	.....	.....	.....	142,290,046	20,148,454	50
14	2,075	7	1,060	.....	.....	.....	.....	40	3,598	25	5,000	.....	.....	10	1,765	26,897,243	146,843	51
88	9,075	6	2,216	4	83	1	100	388	70,598	152	66,563	1	300	6	240	271,013,524	50,444,764	52
.....	.....	3	612	.....	.....	1	30	23	1,790	14	2,700	.....	.....	1	14	15,891,972	722,688	53
3	1,200	5	1,700	.....	.....	.....	.....	9	975	25	4,260	.....	.....	.....	.....	65,630,864	13,823,988	54
12	10,910	.....	.....	.....	.....	2	200	180	103,100	172	139,347	.....	.....	.....	.....	479,114,162	4,152,457	55
1	500	.....	.....	.....	.....	.....	.....	102	17,801	49	11,758	.....	.....	10	250	53,846,178	4,991,422	56
1	35	5	3,860	2	510	4	70	213	50,047	76	46,538	.....	.....	3	100	118,883,821	10,575,864	57
1	875	4	4,510	.....	.....	.....	.....	196	30,472	76	27,127	.....	.....	2	350	101,502,249	12,299,677	58
112	70,235	15	4,025	20	3,110	.....	.....	1,742	786,738	321	370,418	.....	.....	.....	.....	2,671,209,477	292,542,549	59

TABLE 112.—MUNICIPAL CENTRAL ELECTRIC STATIONS—GENERATING AND SUBSTATION AND MAIN

GENERATING EQUIPMENT—NUMBER AND KILOWATT CAPACITY OF DYNAMOS.																
DIVISION AND STATE.		Number of stations.	Direct current.										Alternating and polyphase current.			
			Total.		Constant voltage.				Constant amperage.				Operated by water power.		Operated by other power.	
					Operated by water power.		Operated by other power.		Operated by water power.		Operated by other power.					
					Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.	Number.	Kilowatts.				
1	UNITED STATES.....	2,318	3,437	582,463	23	1,339	759	38,145	6	520	78	3,860	202	122,218	2,369	416,381
GEOGRAPHIC DIVISIONS:																
2	New England.....	72	105	38,784			11	1,265	2	120			26	6,180	66	31,219
3	Middle Atlantic.....	123	222	28,119			29	2,697	2	100	11	412	12	1,425	188	23,485
4	East North Central.....	567	905	191,300	13	575	213	10,407	2	300	24	1,557	55	38,708	598	139,753
5	West North Central.....	760	1,077	105,441	5	440	377	14,916			21	937	12	1,467	682	87,681
6	South Atlantic.....	330	423	62,398	1	37	36	1,218			15	609	28	5,089	343	55,465
7	East South Central.....	154	244	30,306			49	2,521			6	255	5	705	185	26,725
8	West South Central.....	191	304	30,026			31	1,866			1	40	4	450	268	27,670
9	Mountain.....	73	86	10,167			2	42			1	50	28	5,282	55	4,793
10	Pacific.....	48	71	85,922	4	287	11	3,113					32	62,932	24	19,560
NEW ENGLAND:																
11	Maine.....	6	10	1,475					2	120			6	1,230	2	125
12	New Hampshire.....	4	5	850									3	475	2	375
13	Vermont.....	16	17	4,780									13	3,480	4	1,300
14	Massachusetts.....	39	53	27,063			3	380					3	875	47	25,808
15	Rhode Island.....	1														
16	Connecticut.....	6	20	4,616			8	885					1	120	11	3,611
MIDDLE ATLANTIC:																
17	New York.....	55	93	12,870			13	722					8	1,115	72	11,033
18	New Jersey.....	16	27	3,960			2	1,025					1	60	24	2,875
19	Pennsylvania.....	52	102	11,289			14	950	2	100	11	412	3	250	72	9,577
EAST NORTH CENTRAL:																
20	Ohio.....	149	211	45,823			46	2,746			4	236	1	120	160	42,721
21	Indiana.....	90	137	33,784			33	2,150			4	320	1	200	99	31,114
22	Illinois.....	121	188	52,554			46	1,774			5	211	7	28,000	130	22,569
23	Michigan.....	109	207	43,397	4	175	47	1,282			10	700	28	6,662	118	34,578
24	Wisconsin.....	98	162	15,742	9	400	41	2,455	2	300	1	90	18	3,726	91	8,771
WEST NORTH CENTRAL:																
25	Minnesota.....	133	189	21,134	5	440	74	3,283			5	113	4	625	101	16,673
26	Iowa.....	143	165	14,679			80	4,136					4	662	81	9,881
27	Missouri.....	87	154	16,704			33	2,045			8	294			113	14,365
28	North Dakota.....	26	43	2,284			28	916			5	474			10	864
29	South Dakota.....	36	62	3,579			27	676			2	32			33	2,871
30	Nebraska.....	149	197	14,852			89	2,787					3	130	105	11,935
31	Kansas.....	186	267	32,209			46	1,073			1	24	1	50	219	31,062
SOUTH ATLANTIC:																
32	Delaware.....	5	15	1,060			6	230			2	50			7	800
33	Maryland.....	11	20	3,227			3	73			2	80	2	80	13	2,994
34	District of Columbia.....															
35	Virginia.....	24	33	8,001			4	151					13	3,700	16	4,150
36	West Virginia.....	9	20	1,008			3	141			10	419	1	24	6	424
37	North Carolina.....	80	79	11,655	1	37	7	194			1	60	8	795	62	10,569
38	South Carolina.....	41	44	4,153			1	15							43	4,138
39	Georgia.....	128	150	14,174			7	89					4	470	139	13,615
40	Florida.....	32	62	19,100			5	325							57	18,775
EAST SOUTH CENTRAL:																
41	Kentucky.....	22	45	7,292			17	784			3	135			25	6,373
42	Tennessee.....	36	61	9,757			12	1,065			2	120	1	350	46	8,222
43	Alabama.....	45	57	5,563			3	93					4	355	50	5,055
44	Mississippi.....	51	81	7,754			17	679							64	7,075
WEST SOUTH CENTRAL:																
45	Arkansas.....	25	42	4,643			7	290							35	4,358
46	Louisiana.....	36	65	7,476			12	727							53	6,749
47	Oklahoma.....	106	159	12,411			5	106					2	200	152	12,106
48	Texas.....	24	38	5,496			7	743			1	40	2	250	28	4,463
MOUNTAIN:																
49	Montana.....	6	12	1,312							1	50			11	1,262
50	Idaho.....	8	6	1,200			1	25					4	1,150	1	25
51	Wyoming.....	12	11	402			1	17							10	385
52	Colorado.....	16	21	1,965									2	500	19	1,465
53	New Mexico.....	4	9	930											9	930
54	Arizona.....	4	2	810											2	310
55	Utah.....	22	25	4,048									22	3,632	3	416
56	Nevada.....	1														
PACIFIC:																
57	Washington.....	14	23	44,587	1	12	7	3,000					13	32,875	2	8,700
58	Oregon.....	15	17	2,625	1	25	4	113					9	2,132	3	355
59	California.....	19	31	38,710	2	250							10	27,925	19	10,535

GENERAL TABLES.

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STATION EQUIPMENT AND OUTPUT OF STATIONS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

SUBSTATION AND MAIN STATION EQUIPMENT—NUMBER AND KILOWATT CAPACITY.														OUTPUT OF STATIONS (KILOWATT HOURS).			
Rotary converters and motor generator sets.				Boosters.				Transformers.				Auxiliary generators.				Generated during the year.	Purchased during the year.
Substation.		Main station.		Substation.		Main station.		Substation.		Main station.		Substation.		Main station.			
Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.	Num-ber.	Kilo-watts.		
29	5,264	45	8,837	9	163	12	581	992	182,000	880	161,208	9	647	25	1,702	1,089,320,089	192,538,399
3	235	2	375	2	68	3	450	64	6,611	67	7,025	2	162	2	60	59,294,396	20,684,723
13	1,594	18	6,751	2	30	1	36	54	2,105	33	908	1	150	7	564	41,085,600	11,150,438
3	140	14	295	3	30	5	44	367	63,433	445	60,856	2	100	5	100	408,428,566	75,382,992
				2	35	1	15	185	5,658	173	16,192	2	100	5	100	152,907,628	20,427,248
								97	20,890	59	3,511	2	150	3	450	76,096,946	34,450,379
		6	1,225					9	225	6	89					36,436,210	2,104,064
		2	56			2	36	20	370	18	523					40,951,820	3,884,914
10	3,295							39	4,891	19	1,229					18,898,209	3,922,802
								157	77,817	60	70,875	2	85	8	628	205,229,719	20,550,839
								11	740							2,573,741	300,820
				1	50					2	20					488,668	23,030
3	235	1	75	1	18	3	450	16	1,342	12	830					6,607,450	868,609
								35	4,279	45	5,769	2	162	2	60	43,267,411	15,264,448
		1	300					2	250	8	406					100,140	14,144
																6,357,126	4,112,676
				2	30			20	1,205	14	459					18,964,135	4,888,507
		3	135					4	285	4	285					5,144,231	231,390
								34	900	15	164					16,967,284	6,080,541
								58	18,344	148	5,772			4	525	106,501,122	6,272,548
13	1,594	4	2,050					36	1,484	26	1,419					59,896,388	3,548,686
		7	4,184			1	36	184	35,295	189	40,198					152,890,881	56,192,966
		4	287					41	5,519	55	11,595	1	150	3	39	71,608,609	3,970,723
								48	2,791	27	1,872					17,536,571	5,378,069
2	40	6	75			2	28	12	490	8	295					25,989,225	8,373,014
1	100	1	50			1	3	59	1,670	26	590					20,920,941	3,564,651
		3	63	2	15			25	761	46	820	2	100			25,163,657	1,693,497
		2	75							2	10			1	26	1,896,948	842,435
						2	13	2	8	19	77			2	50	3,978,309	345,970
		1	5					22	384	30	431					21,816,241	2,958,918
		1	27	1	15			65	2,345	42	13,969			2	24	53,642,302	2,648,763
								3	56							883,380	
								21	1,338	6	1,000	1	100			5,985,688	169,473
								17	2,129	11	668					11,929,572	798,382
				1	10			14	1,017	6	525	1	50	1	250	1,847,151	1,656
				1	25	1	15	27	4,250	34	1,270			2	200	13,684,018	15,064,991
								15	12,100	2	48					4,899,422	4,162,056
																13,748,048	13,864,520
																23,119,667	389,301
								9	225	3	65					10,356,181	23,650
										3	24					12,073,071	276,162
																4,246,857	1,720,290
																9,760,101	83,962
		3	625					1	22	14	386					5,859,960	474,750
		3	600							2	100					10,695,276	79,600
								1	50	1	33					13,753,211	221,492
								18	298	1	4					10,643,373	3,109,072
		2	56			2	36	1	75							2,832,288	
								6	2,250							3,017,550	1,765,841
										2	100					494,308	113,692
								4	465	9	644					3,210,454	142,044
										2	10					1,352,796	
								9	240							100,689	692,819
								16	1,636	6	475					7,880,974	883,431
								3	225								324,975
9	3,200							33	19,225	23	40,900	2	85	7	405	123,487,135	2,687,018
1	95							10	1,624	12	1,855					6,384,724	994,539
								114	56,968	25	28,020			1	128	75,357,880	16,899,282

TABLE 118.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—LINE EQUIPMENT AND NUMBER OF CUSTOMERS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	NUMBER OF STREET LAMPS.			STATIONARY MOTORS SERVED.		Number of recording meters on consumption circuits.	Number of customers furnished electric current.
		Arc.	Incandescent.	All other varieties.	Number.	Horsepower.		
UNITED STATES.....	6,542	256,960	1,383,219	9,065	1,555,924	9,216,330	7,102,569	7,178,703
GEOGRAPHIC DIVISIONS:								
New England.....	383	24,494	184,554	289	101,513	876,600	662,346	647,289
Middle Atlantic.....	679	77,396	322,557	2,719	157,087	2,596,057	1,581,197	1,523,862
East North Central.....	1,385	75,464	294,459	2,665	119,060	1,920,649	1,884,042	1,919,165
West North Central.....	1,730	16,324	209,580	321	65,188	757,061	988,104	1,025,177
South Atlantic.....	728	13,514	87,624	2,330	19,589	515,293	323,970	357,577
East South Central.....	410	12,098	41,023	426	15,383	138,127	184,126	204,090
West South Central.....	636	12,927	51,131	181	25,684	273,467	345,279	373,180
Mountain.....	337	9,469	46,698	6	21,978	632,439	320,803	337,087
Pacific.....	254	15,274	145,613	128	30,442	1,506,647	812,702	791,276
NEW ENGLAND:								
Maine.....	93	322	17,908	10	3,890	56,985	50,767	51,213
New Hampshire.....	59	67	14,768	.....	3,743	41,020	37,274	38,280
Vermont.....	59	856	9,046	.....	3,448	43,503	30,353	33,147
Massachusetts.....	120	16,375	100,441	.....	65,218	446,026	367,542	344,437
Rhode Island.....	9	2,065	16,202	1	5,283	72,094	45,637	43,817
Connecticut.....	43	5,299	29,189	278	19,931	216,973	130,773	136,395
MIDDLE ATLANTIC:								
New York.....	332	20,373	156,656	284	62,181	1,193,264	846,500	794,516
New Jersey.....	63	13,480	53,652	.....	30,679	262,868	203,542	202,030
Pennsylvania.....	284	43,543	112,249	2,436	64,227	1,139,935	531,165	527,316
EAST NORTH CENTRAL:								
Ohio.....	335	23,498	49,042	.....	35,950	265,260	356,872	353,183
Indiana.....	237	11,610	45,917	459	14,269	139,704	261,696	267,628
Illinois.....	303	15,002	132,363	2,145	20,559	1,079,652	661,956	682,260
Michigan.....	241	18,102	41,366	.....	37,864	248,803	417,843	421,692
Wisconsin.....	269	7,252	25,772	61	10,428	87,230	186,676	194,402
WEST NORTH CENTRAL:								
Minnesota.....	255	5,565	48,222	.....	20,915	282,784	217,391	219,045
Iowa.....	325	2,394	49,705	107	13,042	99,902	193,808	198,119
Missouri.....	293	4,413	30,101	.....	10,710	174,861	253,117	276,463
North Dakota.....	127	497	11,245	.....	2,281	11,102	32,567	35,378
South Dakota.....	131	611	7,578	.....	3,145	19,708	40,290	42,154
Nebraska.....	297	178	27,538	214	7,842	67,435	111,158	116,970
Kansas.....	302	2,666	35,170	.....	7,263	121,259	134,773	137,018
SOUTH ATLANTIC:								
Delaware.....	12	19	1,461	.....	81	708	2,399	3,427
Maryland.....	50	4,874	11,736	123	965	158,334	70,024	69,544
District of Columbia.....	1	1,035	9,093	70	(1)	29,150	35,207	35,207
Virginia.....	94	813	12,783	30	2,243	27,763	30,648	35,705
West Virginia.....	72	2,151	5,617	379	3,883	96,573	29,680	32,520
North Carolina.....	159	1,545	11,692	49	3,744	59,504	44,395	51,603
South Carolina.....	82	1,348	8,579	1,121	2,338	37,509	26,746	32,226
Georgia.....	178	480	14,587	13	4,238	81,517	41,907	47,235
Florida.....	82	1,249	12,076	645	2,097	22,235	42,964	50,110
EAST SOUTH CENTRAL:								
Kentucky.....	125	6,757	10,832	58	9,192	63,784	85,481	91,738
Tennessee.....	106	2,861	14,968	139	3,391	43,213	48,714	52,078
Alabama.....	82	1,702	6,983	229	1,583	17,363	28,740	34,669
Mississippi.....	97	778	8,240	.....	1,217	13,767	21,191	25,606
WEST SOUTH CENTRAL:								
Arkansas.....	96	1,138	9,292	10	1,112	11,533	32,177	42,449
Louisiana.....	85	4,295	7,266	.....	2,863	37,189	46,861	47,536
Oklahoma.....	201	1,925	13,592	171	6,375	61,268	81,451	88,047
Texas.....	254	5,569	20,981	.....	15,334	163,477	184,790	195,148
MOUNTAIN:								
Montana.....	60	1,966	10,658	6	7,374	308,241	56,588	59,176
Idaho.....	46	924	6,863	.....	867	12,668	37,507	39,218
Wyoming.....	43	339	3,728	.....	826	14,957	14,151	19,590
Colorado.....	69	3,272	10,141	.....	8,843	132,013	93,679	92,242
New Mexico.....	29	13	2,287	.....	729	7,626	12,765	13,988
Arizona.....	29	430	4,194	.....	1,364	16,505	24,303	24,320
Utah.....	47	2,511	7,824	.....	1,005	126,555	72,721	77,058
Nevada.....	14	14	1,003	.....	970	15,874	9,089	11,495
PACIFIC:								
Washington.....	88	1,047	26,466	128	5,678	64,694	114,954	115,488
Oregon.....	68	499	10,366	.....	3,284	31,682	57,735	55,985
California.....	98	13,738	108,781		21,480	1,410,271	640,013	619,803

¹ See Table 65.

GENERAL TABLES.

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TABLE 114.—COMMERCIAL CENTRAL ELECTRIC STATIONS—LINE EQUIPMENT AND NUMBER OF CUSTOMERS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	NUMBER OF STREET LAMPS.			STATIONARY MOTORS SERVED.		Number of recording meters on consumption circuits.	Number of customers furnished electric current.
		Arc.	Incandescent.	All other varieties.	Number.	Horsepower.		
UNITED STATES.....	4,224	206,957	962,908	6,801	1,504,864	8,790,707	6,172,486	6,202,189
GEOGRAPHIC DIVISIONS:								
New England.....	311	23,836	153,363	56	92,580	797,778	602,048	589,867
Middle Atlantic.....	556	70,918	301,025	2,563	154,546	2,577,917	1,534,064	1,474,291
East North Central.....	818	45,649	147,190	2,238	105,280	1,801,210	1,610,294	1,636,009
West North Central.....	970	12,504	119,859	53	53,647	687,629	764,768	792,131
South Atlantic.....	398	9,566	50,197	1,406	15,528	465,546	228,565	252,539
East South Central.....	256	10,040	22,516	426	13,823	122,241	149,131	161,641
West South Central.....	445	10,385	31,308	53	23,394	259,602	292,816	314,863
Mountain.....	264	9,255	37,556	6	20,894	625,059	301,455	312,938
Pacific.....	206	14,804	100,394	.....	25,172	1,452,725	689,275	667,910
NEW ENGLAND:								
Maine.....	87	268	12,607	.....	3,830	56,308	49,218	49,659
New Hampshire.....	55	67	13,916	.....	3,687	40,809	35,915	36,901
Vermont.....	43	821	6,489	.....	3,125	40,308	23,148	25,720
Massachusetts.....	81	15,872	80,087	.....	60,956	409,385	325,467	305,404
Rhode Island.....	8	2,065	15,874	1	5,253	72,094	45,312	43,492
Connecticut.....	37	5,243	24,440	55	15,699	178,874	122,968	128,691
MIDDLE ATLANTIC:								
New York.....	277	19,139	149,333	128	60,989	1,183,682	822,236	770,187
New Jersey.....	47	12,628	50,708	.....	30,266	260,908	198,855	197,334
Pennsylvania.....	232	39,151	100,964	2,435	63,291	1,133,327	512,968	506,770
EAST NORTH CENTRAL:								
Ohio.....	186	16,358	22,940	.....	33,455	246,494	278,571	272,185
Indiana.....	147	7,491	23,591	192	11,324	113,416	193,408	197,659
Illinois.....	182	11,431	56,519	2,002	17,619	1,088,725	628,854	649,131
Michigan.....	132	3,801	23,492	.....	23,976	327,462	356,512	357,389
Wisconsin.....	171	6,568	17,648	44	8,906	75,113	152,964	159,645
WEST NORTH CENTRAL:								
Minnesota.....	122	4,681	28,573	.....	18,043	267,891	166,562	167,028
Iowa.....	182	2,126	32,506	53	10,505	79,434	154,396	156,515
Missouri.....	206	3,530	17,529	.....	9,407	164,984	227,164	244,001
North Dakota.....	101	301	8,506	.....	2,079	10,291	28,173	31,113
South Dakota.....	95	364	5,065	.....	2,730	18,195	32,527	34,319
Nebraska.....	148	151	12,543	.....	6,218	47,201	78,323	80,696
Kansas.....	116	1,351	14,637	.....	4,665	99,633	77,623	78,459
SOUTH ATLANTIC:								
Delaware.....	7	.....	904	.....	43	620	1,443	1,964
Maryland.....	39	4,635	10,195	.....	667	155,565	65,626	64,448
District of Columbia.....	1	1,035	9,093	70	(1)	29,150	35,207	35,207
Virginia.....	70	324	6,068	.....	1,707	22,656	23,808	28,103
West Virginia.....	63	1,305	5,190	369	3,873	96,561	29,101	31,580
North Carolina.....	79	966	4,391	26	2,587	46,387	20,747	25,365
South Carolina.....	41	1,070	3,664	941	1,971	34,035	16,343	20,779
Georgia.....	48	174	3,005	.....	3,204	68,624	12,463	14,934
Florida.....	50	57	7,687	.....	1,476	9,918	23,827	30,159
EAST SOUTH CENTRAL:								
Kentucky.....	103	6,343	8,518	58	8,664	59,322	75,838	81,152
Tennessee.....	70	1,516	8,214	139	2,894	39,047	40,718	42,259
Alabama.....	37	1,506	2,520	229	1,337	14,813	20,999	24,470
Mississippi.....	46	675	3,264	.....	928	10,069	11,576	13,760
WEST SOUTH CENTRAL:								
Arkansas.....	71	247	5,945	.....	851	9,755	24,007	33,691
Louisiana.....	49	4,290	3,306	.....	2,231	34,200	37,346	36,708
Oklahoma.....	95	1,730	6,938	53	5,685	55,920	59,721	63,030
Texas.....	230	4,118	15,064	.....	14,627	159,727	171,742	181,434
MOUNTAIN:								
Montana.....	54	1,827	9,334	6	7,094	304,904	53,872	56,228
Idaho.....	38	912	4,978	.....	721	10,977	34,590	36,094
Wyoming.....	31	339	3,163	.....	808	14,796	13,184	18,388
Colorado.....	53	3,249	8,963	.....	8,721	130,760	90,214	88,301
New Mexico.....	25	13	2,001	.....	684	7,203	11,430	12,543
Arizona.....	25	418	4,125	.....	1,285	15,894	23,436	23,185
Utah.....	25	2,483	4,066	.....	633	124,839	65,901	67,055
Nevada.....	13	14	906	.....	948	15,686	8,738	11,144
PACIFIC:								
Washington.....	74	701	5,139	.....	2,475	28,766	39,126	41,291
Oregon.....	53	424	8,116	.....	2,942	29,273	52,114	49,499
California.....	79	13,679	87,139	.....	19,755	1,394,686	596,035	577,120

TABLE 115.—MUNICIPAL CENTRAL ELECTRIC STATIONS—LINE EQUIPMENT AND NUMBER OF CUSTOMERS, BY GEOGRAPHIC DIVISIONS AND STATES: 1917.

DIVISION AND STATE.	Number of stations.	NUMBER OF STREET LAMPS.			STATIONARY MOTORS SERVED.		Number of recording meters on consumption circuits.	Number of customers furnished electric current.
		Arc.	Incandescent.	All other varieties.	Number.	Horsepower.		
UNITED STATES.....	2,318	49,993	420,311	2,264	51,060	425,623	930,133	976,514
GEOGRAPHIC DIVISIONS:								
New England.....	72	648	31,191	233	8,933	78,822	60,298	57,422
Middle Atlantic.....	123	6,478	21,532	156	2,541	18,140	47,113	49,571
East North Central.....	567	29,815	147,269	427	13,780	119,439	273,748	283,156
South Atlantic.....	760	3,820	90,201	268	11,541	69,422	225,336	233,046
East South Central.....	330	3,948	37,427	924	4,061	49,747	95,405	105,038
West South Central.....	154	2,058	18,507	.....	1,560	14,886	34,995	42,449
Mountain.....	191	2,542	19,823	128	2,290	13,865	52,463	59,317
Pacific.....	73	214	9,142	.....	1,084	7,380	19,348	24,149
	48	470	45,219	128	5,270	53,922	123,427	123,366
NEW ENGLAND:								
Maine.....	6	54	5,301	10	60	677	1,549	1,554
New Hampshire.....	4	.....	852	.....	56	211	1,359	1,379
Vermont.....	16	35	2,557	.....	323	3,195	7,205	7,427
Massachusetts.....	39	503	20,404	.....	4,222	36,640	42,075	39,033
Rhode Island.....	1	.....	328	.....	.....	.....	325	325
Connecticut.....	6	56	1,749	223	4,232	38,099	7,785	7,704
MIDDLE ATLANTIC:								
New York.....	55	1,234	7,323	156	1,192	9,582	24,264	24,329
New Jersey.....	16	852	2,944	.....	413	1,950	4,687	4,696
Pennsylvania.....	52	4,392	11,265	.....	936	6,608	18,162	20,546
EAST NORTH CENTRAL:								
Ohio.....	149	7,140	26,102	.....	2,485	18,766	78,301	80,998
Indiana.....	90	4,119	22,326	267	2,945	26,288	68,293	69,969
Illinois.....	121	3,571	72,844	143	2,940	40,927	33,102	33,129
Michigan.....	109	14,301	17,873	.....	3,878	21,341	61,331	64,303
Wisconsin.....	98	684	8,124	17	1,522	12,117	32,721	34,757
WEST NORTH CENTRAL:								
Minnesota.....	133	884	19,650	.....	2,872	14,893	50,829	52,017
Iowa.....	143	268	17,199	54	2,537	10,168	39,412	41,604
Missouri.....	87	883	12,572	.....	1,303	9,577	30,953	32,462
North Dakota.....	26	196	2,739	.....	202	811	4,394	4,265
South Dakota.....	36	247	2,513	.....	415	1,513	7,763	7,865
Nebraska.....	149	27	14,995	214	1,624	10,234	32,835	36,274
Kansas.....	186	1,315	20,533	.....	2,588	21,626	57,150	58,559
SOUTH ATLANTIC:								
Delaware.....	5	19	557	.....	28	88	946	1,463
Maryland.....	11	239	1,541	123	298	2,739	4,408	5,096
District of Columbia.....	.....	.....	.....	.....	.....	.....	.....	.....
Virginia.....	24	489	6,715	30	536	5,107	6,840	7,602
West Virginia.....	9	846	427	10	10	12	579	940
North Carolina.....	80	579	7,301	23	1,157	13,117	23,648	26,238
South Carolina.....	41	278	4,915	180	367	3,474	10,403	11,447
Georgia.....	128	306	11,582	13	1,034	12,893	29,444	32,301
Florida.....	32	1,192	4,389	545	621	12,317	19,137	19,951
EAST SOUTH CENTRAL:								
Kentucky.....	22	414	2,314	.....	528	4,462	9,643	10,586
Tennessee.....	36	1,345	6,754	.....	497	4,166	7,996	9,819
Alabama.....	45	196	4,463	.....	246	2,550	7,741	10,199
Mississippi.....	51	103	4,976	.....	289	3,708	9,615	11,845
WEST SOUTH CENTRAL:								
Arkansas.....	25	891	3,347	10	261	1,778	8,170	8,758
Louisiana.....	36	6	3,960	.....	632	2,989	9,515	10,828
Oklahoma.....	106	195	6,599	118	690	5,348	21,730	25,017
Texas.....	24	1,451	5,917	.....	707	3,750	13,048	13,714
MOUNTAIN:								
Montana.....	6	139	1,324	.....	280	1,337	2,716	2,948
Idaho.....	8	12	1,885	.....	146	1,691	2,917	3,124
Wyoming.....	12	.....	565	.....	18	161	967	1,202
Colorado.....	16	23	1,178	.....	122	1,253	3,465	3,941
New Mexico.....	4	.....	286	.....	45	423	1,335	1,445
Arizona.....	4	12	69	.....	79	611	867	1,135
Utah.....	22	28	3,738	.....	372	1,716	6,730	10,003
Nevada.....	1	.....	97	.....	22	188	351	351
PACIFIC:								
Washington.....	14	346	21,327	128	3,203	35,928	75,828	74,197
Oregon.....	15	65	2,250	.....	342	2,409	5,621	6,496
California.....	19	59	21,642	.....	1,725	15,585	41,978	42,683

APPENDIX

DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

(B 4-537)

SAM. L. ROGERS, DIRECTOR

CENSUS OF ELECTRIC LIGHT AND POWER STATIONS, 1917

EUGENE F. HARTLEY, CHIEF STATISTICIAN

All Census Schedules Light or Power Stations, including Wholesaler Stations, should be reported on this schedule.

No report is required for electric plants owned by the industrial branch of the census, including generating power for the factory, hotel, or other enterprise. Plans of this kind, however, which incidentally sell current must be reported.

Name of Company or Plant _____

Location of plant: State _____ County _____
City or Town _____ Street and No. _____

General Office (Give state, city, street, and number) _____

(Light and power plants operated by the same corporation, firm, or individual, and located in different states, counties, cities, or towns, should be separately reported.)

AUTHORIZATION.

The Act of Congress approved June 7, 1906, authorizes the Director of the Census to collect every fifth year statistics relating to the electric industries, including electric light and power stations and electric railways. The Act approved July 2, 1909, directs that it shall be the duty of every owner, president, treasurer, secretary, director, or other officer or agent of any establishment or company covered by the census inquiry to furnish the information indicated by the schedules that have been prepared in conformity with these requirements.

The last census of electric light and power stations covered the year 1912, and this schedule has been prepared for the census year of 1917. The statistics should relate to the calendar year ending December 31, 1917. Except in the case of number of employees, all questions that relate to a single date, such as cash on hand, number of lamps, etc., should be of the date of the last day of the year covered by the report.

The answers to inquiries in regard to financial matters will be held absolutely confidential; the separate reports will be combined so as to show totals for all companies in each state. The information will be used only for the statistical purposes for which it is given, and will not be disclosed to any individual, state or local authority, or other Bureau or Department of the Federal Government.

Sam. L. Rogers

Director of the Census.

CERTIFICATE.

THIS IS TO CERTIFY that the information contained in this schedule is complete and correct to the best of my knowledge and belief, and it covers the period from _____ 1917 to _____ 1917

(Signature and official designation of the person furnishing the information.)

(Address of person furnishing the information.)

(Signature of Special Agent.)

1-5322

Each question should be answered; if not applicable, use word "None."

In case of electric light and power plants operated in connection with electric utility, a separate report for the electric light and power service should, if possible, be made on this schedule. It is impossible to make complete separate reports for each, one estimated report for electric light and power plants may be made on the following schedule.

If electric light and power plants are operated in connection with any business other than electric utility, and the estimate on and data required, detailed estimates should be prepared for interests in all questions contained in this schedule. In these cases the forms required for electric and telephone, electric street, and electric, and water, street plants may be the electric light and power plant department.

1. Character of organization.

State the main consideration in establishing on the last day of the year covered by the report, whether individual, firm or partnership, partnership company, corporation, or other form.

If a controlling company, write on the last page of the schedule the names and addresses of subsidiary or leased companies for which report is included in this return.

If a subsidiary or leased company, give name and address of operating company or lease.

If the corporation or firm engaged in any business or industry other than that of central station work for electric light and power only? (Yes or no) If so, state the character of such business or industry, and whether conducted in the same or separate plants.

Estimated population of area served with electric current.

2. Power-plant equipment.

Include all generating units in all the plants covered by the report, and give the total horsepower for all included in each group.

GENERATING POWER PLANT.	Total.	See H. P. or other.	See H. P. or other under L. B. F.	See H. P. or other under L. B. F.	See H. P. or other under L. B. F.
Steam engines (not turbines), number					
Total capacity in horsepower					
Steam turbines, number					
Total capacity in horsepower					
Internal-combustion engines, number					
Total capacity in horsepower					
Water wheels and turbines, number					
Total capacity in horsepower					

3. Electrical generators.

Give the total number of each of the three kinds of dynamo, and list total used, showing in brackets of all machines of each kind. If machines are rated in kilowatt-units (K. W.), give estimated equivalent in horsepower.

Dynamo.	Total.		Operated by other power.		Operated by other power.	
	Number.	Total rated capacity in kilowatts.	Number.	Total rated capacity in kilowatts.	Number.	Total rated capacity in kilowatts.
Direct-current, constant voltage.						
Direct-current, constant ampereage.						
Alternating and polyphase current.						

Are machines rated in KVA? If so, is capacity reported in KW equivalent?

4. Output of station.

The output must be obtained from the load voltage and ampereage, or from the actual work or kilowatt reading of dynamo meters.

Kilowatt hours in 1917: Generated Purchased

Total For electric lighting (approximate) For power (approximate)

For all other purposes (approximate) Sold to other companies (approximate)

Distribution and line losses (approximate)

(When alternating current is generated and delivered through substations or D. C., the current generated should be indicated with the total kilowatt output.)

Each question should be answered; if not applicable, use word "None."

8. Miscellaneous statistics.						Number	
Number of stationary motors served (do not include small fan motors).							
Total capacity in horsepower.							
Running motors on consumption circuits.							
Total number of customers furnished electric current during the year.							
EQUIPMENT.							
9. Number of street lamps.							
Amount for all street lamps wired for service on the last day of the year covered by this report.							Number
Are lamps.							
Incandescent lamps (include all filament lamps).							
Other varieties (specify kind).							
10. Substation equipment.							
Give quantity of each character by make power plant as well as that its respective station. Give total number of each class of machines and total rated capacity in kilowatts for all machines of each class.							
	Total number.	Total rated capacity in kilowatts.	In substations.		In main stations.		
			Number.	K. W. capacity.	Number.	K. W. capacity.	
Battery overvoltage motor generator sets.							
Transformers.							
Auxiliary generators.							
	Total number of units.	Total ampere hours.	Number of units.	Ampere hours.	Number of units.	Ampere hours.	
Storage batteries.							
FINANCIAL STATISTICS.							
11. Revenue and income account.							
Give actual amounts received on trading contracts fulfilled. This item includes income and expenses properly belonging to but not actually received during the year, and therefore need not appear under a cash statement. It remains to do and show the balance for each class of contract fulfilled, also amount of unfulfilled contracts at the close of the business or other government, or of expense estimated by lamps not yet installed, and estimate of probable loss from the failure of plants owing to causes beyond company's control.							
The figures of income received on revenue bonds shall be shown in electric revenue, but where the company substantially sells supplies to its customers for sale to others, it may be shown in gas revenue, during the year covered by the report. Salaries and wages must be included, and also shown in a separate item in answer to inquiry 15.							
REVENUES.							
Electric services							\$
Commercial or private light, power, and heat (report income for power separately if practicable).							
Commercial or private power (if income for power can be shown separately).							
Municipal street lighting, both new and incandescent.							
Sale of electric current to other public service corporations.							
Interest and dividends from investments.							
All other income, including rents and profits on merchandise sold (not the total amount of such sales).							
TOTAL.							\$

SCHEDULE USED IN SECURING STATISTICS OF ELECTRIC LIGHT AND POWER STATIONS: 1917—Continued.

4

Each question should be answered; if not applicable, use word "None."

EXPENSES	
Supplies and materials used for ordinary repairs or replacement, and salaries and wages, as shown in answer to Inquiry 13.	\$
Fuel	\$
Electric current and electric power purchased	\$
Rent of offices, stations, line-wire supports, conduits, underground and water privileges	\$
All other expenses incident to operation and maintenance, such as advertising, law expenses, telegraph and telephone service, postage other than electric, and miscellaneous items of expenses, not elsewhere included	\$
Taxes:	
Real and personal property	\$
Capital stock	\$
Federal corporation tax	\$
Earnings	\$
Miscellaneous (specify items)	\$
Interest on funded and floating debt and mortgages	\$
Injuries and damages, and legal expenses incident thereto	\$
Insurance	\$
Charges for depreciation, if any	\$
Charges for sinking or other reserve funds, if any (if charged against income)	\$
TOTAL	\$
Dividends declared during the year:	
On common stock	\$
On preferred stock	\$
18. Free service.	
Give the estimated value of current supplied free to municipalities or other government or municipal plant. The estimate must be based upon the prevailing commercial rates. Do not include items reported in Inquiry 13.	
If the report is for a commercial company, give the estimated value of free service furnished municipal or other government	\$
If the report is for a municipal plant, give the amount of estimated income represented by current consumed in lighting streets, parks, public buildings, etc., for which no income is received.	\$
19. Employees, salaries, and wages.	
The salaries and wages reported here should be the total amount paid during the year, and should also be included in the amount reported for the total cost of operation in Inquiry 13.	
General superintendents or other persons, if considered as salaried employees, should be reported in this item. Do not include in this item the salaries of persons employed in the construction of new plants, or the salaries of persons employed in the maintenance of existing plants, or the salaries of persons employed in the operation of the plant, or the salaries of persons employed in the sale of electricity.	
If possible, give number employed on December 31, 1917, or per day or month. If data are not available for that day or month, give the data for nearest representative or normal day, and state day and month here.	
	Number December 31, 1917.
	Salaries and wages for year.
Salaried employees:	
Salaried officers of corporation	\$
Superintendents and managers	\$
Clerks, stenographers, and other salaried employees	\$
Total for salaried employees	\$
Wage earners (do not include salaried employees reported above or those engaged exclusively on additions or alterations)	\$

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Each question should be answered; if not applicable, use word "None."

14. Balance sheet.			
ASSETS		LIABILITIES	
Kind.	Amount.	Kind.	Amount.
Plant and equipment	\$	Common	\$
Other physical property	\$	Capital stock: Preferred	\$
Stocks and bonds of other electric companies	\$	Debt	\$
Stocks and bonds of companies other than electric companies	\$	Funded debt	\$
Treasury securities: Stock	\$	Cash investment (for unincorporated companies)	\$
Bonds	\$	Real estate mortgages	\$
Other permanent investments (specify)	\$	Floating debt (bills and notes)	\$
Cash and notes and accounts receivable	\$	Reserves	\$
Materials and supplies	\$	Bills and accounts payable	\$
Stock and bond discount	\$	Interest, rents, and taxes due and accrued	\$
Shipping and other special funds	\$	Dividends due and payable, but unpaid	\$
Interest, dividends, and rents receivable	\$	Premiums on capital stock and funded debt	\$
Bundled (specify principal items)	\$	Bundled (specify principal items)	\$
TOTAL	\$	TOTAL	\$
15. Fuel used: Give the quantity of each of the five kinds of fuel used during 1917.			
Coal, anthracite	Ton (2,240 lbs.)	Quantity.	
Coal, bituminous	Ton (2,240 lbs.)		
Oil	Ton (2,240 lbs.)		
Gas (state whether natural or manufactured)	1,000 cu. ft.		
REMARKS:			

INSTRUCTIONS TO SPECIAL AGENTS.

LISTS AND CANVASS OF ESTABLISHMENTS.

Unlisted establishments.—Although the list of establishments furnished special agents has been made as complete as possible, it has not been practicable to secure absolute accuracy and completeness, and *special agents must be constantly on the alert to discover plants not named on the list. They will be held strictly accountable for a complete canvass of the district to which they are assigned.* They must make careful inquiry for other plants located in that vicinity.

The agents must account for all of the names on the list. A return must be secured for each establishment not already disposed of as noted on list or a satisfactory explanation given on the daily report. This explanation must be such as "Out of business, no successor," "Isolated plant, no current sold," or "Only — per cent sold." The explanation given on the daily report must be full and complete, leaving no doubt as to the conditions. The number of the establishment on the typewritten list must in all cases be written in the upper right-hand corner of the schedule and on the left-hand margin of the daily report.

Change in name of establishment.—If a change has been made in the name or location of the plant since the list was prepared, or if a report is secured for an establishment under a different name from that appearing on the list, the list must be changed (without erasures) to agree with the new conditions and this change must also be stated on the daily report.

Idle plants.—All plants that commenced operations or did any work during the census year ending December 31, 1917, must be reported, although they may not have been in operation at the end of that year. Reports are not required for plants which were closed or idle during the whole of the year. The circumstances, however, should be explained in the daily report of the agent.

Central offices.—A large number of properties are controlled from offices located elsewhere than at the plants. When known, central offices of this character and the names of the plants for

which reports will be prepared at the central office are indicated on the lists. Agents canvassing the districts in which central offices are located must in every instance call at these offices for reports before canvassing the other plants. A return must be secured for every plant noted on the central office list. A large number of controlling companies have advised the office that reports for certain properties will be prepared at their office. The names of these properties will appear on the agent's list, but with a notation, "Central office," or "Report will be secured at —." Agents must not secure reports for these plants unless the central office is within their district, and then from the business office. If in the city where such plants are located, however, the agent should call and explain that a census of electrical industries is being taken, also that it is understood the report is being prepared at the central office of the company. If the report has not already been made from the plant to the central office, a proper blank schedule should be left and explanation made of the inquiries therein as desired by the person in charge, so that the local officials will know just what information is required if the central office requests them to furnish data for the reports. All such visits should be noted on the agent's daily report.

If a plant is owned by a company whose business office is in another locality, outside the territory assigned the agent and not noted on the list as a central office plant, a portion of the information for which must be obtained from the business office, the agent should complete the schedule so far as possible from the data obtainable at the plant and forward it to the Census Bureau with a full statement of the facts, giving also the name and address of the person from whom further information can be obtained. The agent must, however, exhaust every reasonable means to complete the report before sending it in to the Census Bureau.

Annual reports.—In all cases where an annual report of the company is printed, a copy of the latest report should be secured and forwarded with the schedule. Copies should also be returned of the latest report of the directors or officers of the company, or

other printed matter that would add to the information contained in the schedule.

Correction of reports.—An agent should not return to a city already canvassed by him to secure information for a report returned for correction unless especially advised to do so. It is believed that the agent will be able in most cases to supply the information from his knowledge of the conditions or by use of phone. If he can not do so, he should return the schedule to the Census Bureau with such explanation for his error or neglect as he may be able to make. To obviate the necessity of returning schedules for additional information, the agent must carefully examine each report before sending it to the office, since he is expected to secure *complete* reports for all plants not already disposed of on his list before leaving the locality.

METHOD OF SECURING SCHEDULES.

Reports secured by mail.—Schedules were mailed to all companies, and if a report has been received, the name on the agent's list will be marked "Schedule received." If the mail report is unsatisfactory, that fact probably will be indicated on the list. If not satisfactory, the original will be sent to the agent to complete. When completed or corrected such reports must be signed by the agent and promptly returned. If it is found advisable to prepare a new report in place of the original, such report must be marked "Corrected report" on the title-page, and the original marked "Void; see corrected report," and returned with the new report.

Promptness of agents.—In many cases the schedule mailed to the company to be made out and sent back to the office will not have been returned to the bureau and may not be ready when the agent calls. In that event the agent will secure the report at once. If the agent has not been advised that the office is in receipt of any report, whether or not on his list, he must secure the same, or copy, although the company may claim that the report has been furnished.

TITLES OF SCHEDULES.

The electrical industries covered by the census of 1917 will be reported on the following schedules:

- Schedule A 5-539. Electric railways.
- Schedule A 6-540. Nonoperating and lessor electric railways.
- Schedule B 4-537. Electric light and power stations.
- Schedule D 15-543. Telephones (large commercial systems).
- Schedule D 16-544. Telephone (short schedule for small commercial systems and independent farmer or rural lines).
- Schedule D 17-553. Census of telephones, 1917—Supplemental inquiry concerning weekly rates of pay of employees.
- Schedule D 14-542. Municipal electric fire-alarm and police-patrol signaling systems.
- Schedule D 13-541. Telegraphs.

The reports for commercial telegraph companies (Schedule D 13-541) will be collected wholly by correspondence. Reports for the industries covered by the other seven schedules will be secured by the field force, and also by correspondence.

PREPARATION OF THE SCHEDULES.

Answers to inquiries to be taken from books of accounts and records.—The information secured must be accurate. In drafting the schedule every effort has been made to frame the inquiries in such a form that the answers to them can generally be taken directly from the books of accounts and records. The agent may find a disposition on the part of persons furnishing the information to give general statements or estimates, claiming that they approximate very closely the exact figures. In no case should these general statements or estimates be accepted where it is possible to secure the answers directly from the books of accounts and records. If the accounts cover two or more of the items enumerated for any of the inquiries, the total should be equitably apportioned for the reply to each subinquiry. In all cases where the answers are estimated the amounts must be preceded by the word "Estimate."

All answers must be made clearly and neatly in ink. Each question is to be answered. If any question is found not applicable and no amounts are reported, write the word "None."

Some of the inquiries require no explanation, but the following instructions, in addition to those on the schedules, should be followed by the agents in preparing all reports:

The title-page.—Page 1 must contain the name and location of the company, the address of the general office, the signature, address, and official designation of the person furnishing the information, and the signature of the special agent. *Place the office number of the report in the upper right-hand corner.* If the address of the general or business office is at a different place from that of the plant, care must be taken to give both.

The period covered, where possible, should be that of the year ending December 31, 1917. Where, however, the business year of the establishment does not correspond to the calendar year, the data may be secured for such completed business year as corresponds most nearly to the calendar year 1917. The reports for plants that were in operation only a portion of the census year will be tabulated separately; therefore it is essential to give on the title-page the *exact period* covered by each report.

ELECTRIC LIGHT AND POWER STATIONS. (SCHEDULE B 4-537.)

Reports must be secured for all electric plants doing a public-service business—that is, for all plants, whether owned or operated by individuals, firms, corporations, or municipalities, generating or purchasing electric current for sale that were in existence during any portion of the year ending December 31, 1917.

No report is required for isolated electric light or power plants operated primarily for the benefit of the owner in lighting and furnishing power for his factory, hotel, or other enterprise, even though some current may be sold to his employees. If, however, current is sold to the public generally, secure a report. The instructions on the title-page of the schedule that "isolated plants which incidentally sell current must be reported" were intended for the guidance of persons who would receive the blank schedule by mail, to avoid the possibility of omitting any central stations. Such plants are not considered as central stations, and agents must not secure reports for them.

Electric plants owned by the United States and state governments and operated primarily for supplying light or power to public buildings, military posts, naval stations, Indian reservations, etc., should be considered isolated plants operating for their own benefit and no report secured.

Combined reports.—If the electric plant is operated in connection with an electric railway, separate reports should, if possible, be prepared, as required by the instructions on page 2 of the schedule.

If the electric plant is operated in connection with any business other than a street railway, and the system of accounts will not permit of the preparation of a separate return, careful estimates must be prepared for answer to all the questions contained in the schedule. These estimates must pertain *only* to the electric light and power station, and be prepared by, or submitted to and approved by, the person furnishing the information and that fact indicated under "Remarks" on the last page of the schedule.

Where two or more plants are owned by one individual, firm, or corporation, and located in the same city or town, one combined report may be secured. In such cases the number of separate plants included in the report, and their names and locations, should be stated under "Remarks" as called for under Inquiry 2. Light and power plants operated by the same corporation, firm, or individual, and located in different states, counties, cities, or towns, should be reported separately, if practicable.

Rates.—A presentation will be made of rates for the sale of current, for light, and for power for cities of 10,000 or more inhabitants. Agents will inclose list of rates if the company publishes one, and if such lists are not available give the information under "Remarks."

Inquiries 1, 2, 3, and 4 seem to require no explanation; they are, however, absolutely essential and no report will be accepted as complete where answers to them are omitted.

INQUIRIES 5, 6, 7, AND 10.—POWER-PLANT EQUIPMENT, GENERATORS, OUTPUT, AND SUBSTATION EQUIPMENT.

These inquiries correspond with Inquiries 8, 9, 10, and 11 of the railway schedule, * * * and are not, therefore, repeated here. (See p. 175, report on Electric Railways.)

In addition to the instructions for Inquiry 10 of the schedule for electric railways, attention is called to the following: The kilowatt hours may be tested by the earnings, as reported in Inquiry 11, and estimated value of free service, as reported in Inquiry 12. The average varies considerably for individual plants, but if the average is less than 1 cent or more than 15 cents per kilowatt hour the figures should be questioned, and if found correct, explanation made under "Remarks" on the last page of the schedule.

A standard arc lamp consumes from 450 to 550 watts per hour; ordinary carbon filament incandescent lamps of 16 candlepower have an average consumption per hour of about 3.1 watts per candlepower.

In all calculations of average earnings per kilowatt hour and consumption of current per lamp, etc., the loss of current in transmission must be considered.

INQUIRY 8.—MISCELLANEOUS STATISTICS.

Stationary motors.—This term is applied by central station men to electric motors that are permanently located in one place, as distinguished from electric railway motors on cars. Such stationary motors will cover an infinite variety of work, and in many cases the companies may have difficulty in reporting the number on their circuits, especially where current is furnished through meters. Where exact figures can not be given from records it is desirable that a close estimate be secured. The field covered by these stationary motors will include every class of industrial work and many other methods of application, such as in running large ventilating fans, elevators, etc. It is a custom of many companies to make special rates for what they call "power" business, as distinct from that done in supplying current for lamps, and where this is the case, their records will no doubt show separately the data as to motor or power service and income, as called for under Inquiry 11.

Recording meters on consumption circuits.—This inquiry applies solely to the number of electric meters installed on the consumers' premises, just as gas meters are placed for recording gas consumption, and does not apply to meters installed at the central station.

INQUIRY 9.—NUMBER OF STREET LAMPS.

The answers to this inquiry must show the total number of the different varieties of street lamps connected or wired ready for service on December 31, 1917, or the last day of the period covered by the report, and not the number actually performing service at any one time. The total must include all street lamps in position to earn an income, irrespective of their ownership.

The arc electric lamps employed in street lighting usually are those having either one or two pairs of carbons inclosed in a single large globe. An inclosed arc lamp has two globes, a large or outer one inclosing a small one in which a single pair of carbons is incased, and is designed to burn a large number of hours (100 to 150) before having the carbons renewed. No distinction, however, is desired as to the particular kind of arc lamps used.

INQUIRY 11.—REVENUE AND INCOME ACCOUNT.

The instructions on the schedule and those for similar inquiries (Nos. 13 and 14A) of the electric railway schedule (see p. 176, report on Electric Railways) are sufficient to enable a proper understanding of this inquiry. The following points, however, may be emphasized:

The revenue and expenses must cover the financial transactions of the entire system covered by the report for the year to which it relates.

The amounts must be only those incident to the operation and maintenance of the plant or plants covered by the report.

Do not include expenditures for additions or extensions.

Do not include under Inquiry 11 estimated income for free service, but report this as called for under Inquiry 12 only.

Since only the profit on merchandise sales is to be reported as an income, the cost of such supplies must not be included.

Show the amount received for sale of power separately, if possible.

The expenses for taxes and interest must include all amounts properly chargeable to these accounts.

Central electric stations are frequently operated in connection with the manufacture of gas or ice, the operation of waterworks or commercial enterprises. In such cases the income, expenses, and balance sheet should relate only to the operation of the electric plant, and careful estimates should be given if accurate figures can not be obtained from book accounts. However, if the other industry is merely incident to the operation of the electric plant the report may, if necessary, cover both. In such cases the income

from the outside industry should be included in the total reported for "All other income, including rents and profits on merchandise sales," and a statement made under "Remarks" as to what has been so included.

INQUIRY 12.—FREE SERVICE.

Practically all of the central stations owned and operated by municipalities receive no income from current furnished for the use of their respective cities. A number of the commercial stations also furnish current to municipalities or other governments free of charge. The estimated value of the current thus furnished free, based upon the prevailing commercial rates, should be reported *only* in answer to this inquiry.

INQUIRY 13.—EMPLOYEES, SALARIES AND WAGES; AND INQUIRY 14.—BALANCE SHEET.

See instructions for Inquiries 15 and 16 concerning electric railways (see pp. 176-177, report on Electric Railways), which are so nearly applicable that they may easily be used.

MUNICIPAL PLANTS.

Schedule B 4-537 is prepared primarily for plants owned by individuals, firms, or corporations. In applying this schedule to plants owned and operated by municipalities certain changes will be necessary. These changes should be made by the agent, and additional information, when required, must be given under "Remarks" on the last page of the schedule.

It will often occur that the administration of a municipal plant is assigned to a public officer or officers performing other duties, or that a part or all of the labor of collecting and accounting is done in the office of some other department—waterworks, for example. If in these cases a general account is kept for two or more departments, such as water, streets, etc., the expenses for the electric plant should be apportioned equitably. The following plan is suggested to aid in arriving at an equitable apportionment of the salaries, wages, miscellaneous expenses, etc.: For officers, clerks, and all employees, charge to each service the same proportion of the total amount paid in salaries or wages as the time devoted to that service constitutes of the whole time worked; for rent and all sundry office expenses, charge in proportion to the income of each service; for insurance, taxes, law expenses, interest, and all contingent expenses, in proportion to the amount of investment; for fuel, water, and all other power expenses, in proportion to the horsepower utilized by each service.

Inquiry 11—Revenue and income account.—As shown by the instructions on the schedule, the income for municipal plants must include only the actual amounts carried on income-account statement.

An estimate of the value of the service to the city, based on prevailing commercial rates, must be given only in answer to Inquiry 12. If, however, a municipality appropriates a definite amount for the service, it must be reported as income.

Inquiry 14—Balance sheet.—The portion of the inquiry relative to capital stock and dividends is not applicable to municipal plants. As a rule, there is a special bond issue to cover the installation of the electric plant. The amount of such bonds authorized by the special act and the amount outstanding at the end of the year, together with the interest paid or due for the year, should be reported. If, however, there was no special issue of bonds, the cost of the electric plant being met by proceeds of a general bond issue or special tax fund, a full explanation of the arrangement and a description of the general bond issue or special tax should be given under "Remarks."

